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Vladimir Geroimenko *Editor*

Augmented Reality Art

From an Emerging Technology to a Novel Creative Medium

Third Edition

Springer

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This pioneering book is dedicated to the future generations of augmented reality artists.

In the memory of Mr. Mohamed Farid Khamis (1940–2020), the founder of the British University in Egypt.

Preface

The book you are holding in your hands in a paper, or more likely digital, format is a unique one. This is the third edition of the first ever monograph that explores the exciting field of augmented reality art and its enabling technologies. It is written by a team of world-leading artists and researchers, pioneers in the use of augmented reality as a novel artistic medium, and is being dedicated to the future generations of augmented reality artists.

This book explores a wide range of major aspects of augmented reality art and related technologies. It is intended to be a starting point and essential reading not only for artists, researchers and technology developers, but also for students and everyone who is interested in emerging augmented reality technology and its current and future applications in art.

It was difficult to make this book happen, because augmented reality art is still in its infancy, and there are therefore relatively few research materials available. We owe a debt to our contributors who have managed to produce this monograph in the face of these difficulties. Our virtual team includes 33 researchers and artists from 11 countries (Australia, China, Egypt, Germany, Ireland, Norway, Portugal, Romania, Slovenia, UK and USA).

The new edition can be considered as part of a series of seven pioneering monographs published by Springer on the same subject of augmented reality and with the same editor:

1. *Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium*. Geroimenko V (Ed), Springer, 2014
2. *Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium*. Geroimenko V (Ed), 2nd Edition, Revised and Updated, Springer, 2018
3. *Augmented Reality Games I: Understanding the Phenomenon of Pokémon GO*. Geroimenko V (Ed), Springer, 2019
4. *Augmented Reality Games II: The Gamification of Education, Medicine and Art*. Geroimenko V (Ed), Springer, 2019

5. *Augmented Reality in Education: A New Technology for Teaching and Learning*. Geroimenko V (Ed), Springer, 2020
6. *Augmented Reality in Tourism, Museums and Heritage: A New Technology to Inform and Entertain*. Geroimenko V (Ed), Springer, 2021
7. *Augmented Reality Art: From an Emerging Technology to a Novel Creative Medium*. Geroimenko V (Ed), 3rd Edition, Revised and Updated, Springer, 2022

The book's 21 chapters, which can be read in sequence or randomly, are arranged in 4 parts as follows.

Part I "The Theoretical Aspects of Augmented Reality Art and Technology" includes 5 chapters (Chaps. 1–5).

Chapter 1 "ART for Art Revisited: Analysing Technology Adoption Through AR Taxonomy for Art and Cultural Heritage" states that understanding how effective technology adoption is and how well opportunities created by advances in technology are utilized is vital for supporting adoption and development of technology. To this end the authors propose an activity-based taxonomy method designed to produce technology adoption insights. The method is applied on adoption of augmented reality (AR) technology in the context of art and cultural heritage. Through this the authors build an AR taxonomy for art and cultural heritage which they then used to classify 119 AR applications in this domain. The results of classification provide meaningful insight into technology adoption, and how it changed compared to reports in the previous edition of this book. To name a few: (i) general lack of support for communication and personalization activities persist; (ii) the quality of adoption remains below satisfying level, yet some improvements have been made within the past few years; (iii) despite limited immersion capacity, handheld AR systems persist to be the most commonly used systems; and (iv) irrespective of difficult and costly setups a substantial proportion of classified systems represent spatial AR systems; yet this ratio recently dropped due to the higher adoption of head-mounted display systems, which is largely limited to the research domain.

Chapter 2 "Making Sense of ARt: A Methodological Framework for the Study of Augmented Reality Art" (a new chapter in this edition) begins with an assertion that over a decade, artists and creators have leveraged augmented reality technology to protest and reimagine their physical worlds through socially and politically engaged augmented reality art (ARt). This critical corpus of works is an important, though underexplored, dimension of the ARtistic canon, and of the genealogy of augmented reality technology. To facilitate deeper ethnographic engagement with today's critical ARt practices, this chapter addresses a methodological gap in the digital ethnographer's toolkit by providing a medium-specific approach to the study of ARt. With this framework, termed "critical sensory ethnography", this chapter demonstrates that embodied, immersive experience is a socially and politically salient phenomenon that necessitates ongoing, critical study. To illustrate this approach, the chapter concludes with a case study featuring an AR memorial to George Floyd created by American artist Steven Christian in support of the Black Lives Matter movement.

Chapter 3 "Why We Might Augment Reality: Art's Role in the Development of Cognition" is based on an assumption that art serves a neurological role, shaped by evolution. Art, not as a thing that is, but as a function that occurs, which the author calls Behavioural Art (BA). An important aspect of BA is "borrowing intelligence" from a humanly organized source, such as a painting, applied to a computer process. The resulting artefact of this auto-creative process might easily be mistaken for an object de (computer) art. But the author looks further into the larger dynamic system, one that includes the audience as well. As he discusses, the machine itself is incapable of meaningful organization (i.e., alphabetical order is an arbitrary scheme to a machine.) A human (often the programmer) must supply the organizational paradigm to the input, and a human must recognize one in the output. However, by integrating resources from the environment via machine, a process we can now call augmented reality. We might imbue whatever quality triggered an interpretation of "potentially meaningful" in audience members regarding the off-screen image, to our computed output. In this chapter, the author addresses how and why humans tend to employ this subtle particular form of nonverbal expression.

Chapter 4 "Shifting Perceptions—Shifting Realities—Shifting Spheres" (a new chapter in this edition) showcases a journey of creative expression using augmented reality as experiential commentary on socio-economic conditions. The AR journey begins on earth and takes the artist to the moon. On one hand, on the earth, an AR heart is located at a local park during Occupy, an international progressive socio-political movement. The ubiety of the AR art provoked an intimate encounter with a local park patron that illustrates the multiplicity of realities related to technology, environment, poetry and socio-economic circumstances. The chapter expands on a moment when the artwork provokes a dialogue and becomes social theatre in Bloomington, a town in Indiana USA. "heARt to heARt", the AR art is a pointer to a personal cultural history and extends a revolutionary's portrait into the world which in turn creates a poetic encounter during the socio-economic storm of the Occupy movement. AR art was experienced in cities all over the world from New York to its perilous appearance in Shanghai, China. And on the other hand, on the moon, the "Seed Robots" plan, organize and build a person's lunar comfort zone in the Moon Lust exhibition that explores global interests and issues pertaining to lunar exploration and habitation.

Chapter 5 "Augmented Reality, the Expansive Object, and the Vivification of the Memory Theatre: Field Notes" (a new chapter in this edition) considers augmented reality as an Instant semiotic which begins to problematize, explore, and enlarge the connections between people, systems and things. The discussed artworks are a reified memory theatre, a destabilizing mélange of subjectivities loosely hung on the framework of the works' object-ness. These are portals, parasites and libraries of imagination and thought. Defining "object" and "augmented reality" implies that AR represents the consolidation of a world in which each location, target, object or scene is tagged or transformed into a link. This new technology is a tool, a technique and an interaction but also liberally reflects inquiries of other fields. We see the musings of speculative realism and a renewed focus on the reified object in augmented reality. And yet, the notion of a memory theatre or memory code, an ancient tool of human cognition, might be the most explicit metaphor for augmented reality. The new

technology updates the memory theatre as an extreme spatialization of knowledge and experience mapped upon location through digitization. This chapter provides the field notes of the use of augmented reality in two exhibitions, *ClownTown (2016)* and *Synthetic Cells: Site and (Para)Site (2018).*

Part II "Augmented Reality Art and a Variety of Spaces" comprises 6 chapters (Chaps. 6–11).

Chapter 6 "Critical Interventions into Canonical Spaces: Augmented Reality at the 2011 Venice and Istanbul Biennials" describes augmented reality interventions led by the author Tamiko Thiel in 2011 with the artist group Manifest.AR at the Venice Biennale, and in collaboration with the design office PATTU at the Istanbul Biennale. The interventions used the emerging technology of mobile augmented reality to geolocate virtual artworks—visible for viewers in the displays of their smartphones as overlays on the live camera view of their surroundings—inside the normally curatorially closed spaces of the exhibitions via GPS coordinates. Our interventions used the site-specific character of the technology to create works of art that stand in dialogue with the sites and will retain their relevance long after the biennials are over. The site figures as the canvas for the artworks and forms an integral visual and contextual component of each artwork. Unlike physical art interventions, the artworks cannot be removed or blocked by the curators or other authorities and will remain at those locations as long as the artist desires. The artworks exploit the site-specificity as an integral part of the artwork while simultaneously questioning the value of location to canonize works of art, and the power of the curator as gatekeeper to control access to the spaces that consecrate works of art as part of the high art canon.

Chapter 7 "Merging Spaces: Augmented Reality, Temporary Public Art, and the Reinvention of Site" (a new chapter in this edition) explores how augmented reality has redefined temporary, site-specific public art, expanding the field by introducing new practices, and offering possibilities for public engagement that did not exist before. The chapter investigates temporary and site-specific public art before AR technology, then looks at Broadway Augmented—an innovative early augmented reality public art project located in Sacramento, California—and finishes with recent projects that exemplify how the field has expanded. Developments in AR technologies, mobile devices and ubiquitous networks have meant that augmented reality art can have an immediate public presence, responding to social, environmental and cultural issues as they are unfolding, making it the ideal form of public art for the twenty-first century.

Chapter 8 "Data Narratives: Aesthetic Activation of Urban Space Through Augmented Reality" (a new chapter in this edition) discusses *Data Narratives*, a commissioned augmented reality artwork resulting from a period as artist in residence with Dublin City Dashboard. *Data Narratives* focused on working with city data to create hybrid artistic representations of Dublin's ongoing housing affordability crisis, acting both as activist artistic engagement with the socio-political-economic space of the city and aesthetic activation of urban space through augmented reality. As data describes and defines so much of our digital everyday, the project and residency programme asked how it could be leveraged as a medium for artistic creation and how

could art supply new insights into these data and the life worlds they describe? Additionally, the project explored collaborative methodologies working in AR, increasingly important for artists producing complex AR works with the latest generation AR toolkits. The chapter gives an account of this project detailing its ambition to utilize AR art to build AR prototypes that over-layered city neighbourhoods with a series of cellphone-based data-driven AR narratives. Contextual location-based narratives that visualize and engage complex issues. The process of building an artistic AR layer built on civic data is detailed and the paper discusses its provision of a contextual layer that promoted reflection, informed debate, supported decision-making, while connecting city residents with their city through renditions of its data.

In Chap. 9 "Beyond the Virtual Public Square: Ubiquitous Computing and the New Politics of Well-Being", Gregory Ulmer theorizes augmented reality, and ubiquitous computing in general, while John Craig Freeman presents examples of his work in place-based augmented reality public art and describes the work within the framework of electracy (the digital apparatus). Apparatus theory correlates technological innovations with the corresponding inventions in institutional practices, including individual and collective identity behaviours. Ulmer and Freeman, working with an electrate consultancy–the EmerAgency–test an augmented deliberative design rhetoric intended to overcome individual alienation from collective agency. It is an electrate equivalent of the ancient Theoria, a community practice in which a team of trusted citizens travelled to sites of events to sort out fact from rumour. Results of this theory tourism were reported in the public square and certified as truth. Theoria, augmented by literacy, became journalism–the fourth estate of a democratic society. The konsult practice described in this essay updates Theoria for a fifth estate with a new function supporting collective well-being, in the global experience of a potentially ubiquitous public square.

Chapter 10 "Augmenting Environmental Graphics in Healthcare Spaces" (a new chapter in this edition) explores how augmented reality technologies can be used to augment the Environmental Graphic Design typically seen in healthcare environments such as hospital wards, public health spaces, clinics, and consultancy waiting rooms. The authors use the term Environmental Graphic Design to include all 2D design and visual artworks as aspects of placemaking that connect people to the built environment, including visual identity, wayfinding, communication graphics and wall art. From the perspective of the different users of public healthcare environments, they develop discourse around what kind of digital content might be useful and desirable to overlay onto physical environmental graphics. Concepts including Salutogenic Design (the design of healthy environments) and Positive Technology, use of technologies to improve experiences are discussed as ways of thinking about placemaking through the use of hybrid visual/digital displays. The chapter includes a review of existing practices and describes original experimental case study material that is designed to ascertain how a digitally augmented Environmental Graphic Design activation might affect the workplace experience and emotional well-being of healthcare professionals.

Chapter 11 "Augmented Reality Interventions in Shared Space: Subversion and Social Impact" (a new chapter in this edition) is a conversation between writer/curator

Jesse Damiani and artist Nancy Baker Cahill about her innovative augmented reality practice, their artistic collaborations and the potential of augmented reality technology to affect social change. The interview examines the possibilities and limitations of contemporary AR as an artistic medium, the ways AR can be used as a novel form of public art and idea activation, and the evolving relationships that AR interventions can foster among artists and audiences. The interview focuses on the intervention as a form that artists can use to invite new understandings of physical and virtual space. By intervening physical spaces with augmented experiences, artists can highlight unseen or underexplored social issues, provoke new conversations around them and drive new understandings of these sites in ways that prompt social change within local communities and among the broader public.

Part III "Augmented Reality as a Novel Artistic Medium" consists of 6 chapters (Chaps. 12–17).

Chapter 12 "The Aesthetics of Liminality: Augmentation as an Art Form" shows that since its emergence as an art medium, augmented reality has developed as a number of evidential sites. As an extension of virtual media, it merges real-time pattern recognition with media, finally realizing the fantasies of William Gibson through goggles or handheld devices. This creates a welding of a form of perceptual vision and virtual reality, or optically registered simulation overlaid upon actual spatial environments. And even though AR-based works can be traced back into the late 1990s, much of this work required at least an intermediate understanding of coding and tethered imaging equipment from webcams to goggles. It is not until the advent of marker-based AR possessing lower entries to usage, as well as geolocational AR-based media through handheld devices and tablets that Augmented Reality as an art medium would begin to propagate. While one can make arguments that much AR-based art is a convergence between handheld device art and Virtual Reality, there are gestures that are specific to Augmented Reality that allow for its specificity as a genre. In this chapter, the author looks at some historical examples of AR, and critical issues of the AR-based gesture, such as compounding of the gaze, problematizing the retinal and the representational issues of informatics overlays. This also generates four gestural vectors analogous to those defined in *The Translation of Virtual Art* (Lichty P. The Translation of Art in Virtual Worlds. In: The Oxford Handbook of Virtuality. Oxford University Press, 2014), which the author examines through case studies. Through these case studies, historical and recent to the time of this publication, he tries to determine the issues of the gestures and aesthetics of AR.

Chapter 13 "Augmented Reality in Art: Aesthetics and Material for Expression" begins with a statement that Cinematic Apparatus theory of the 1970s set the stage for cinematic deconstruction in avant-garde film art. The material and production elements repressed in the normal ideological apparatus became the arena for new expression. Cinema, through its acceleration of mechanization and sequence, became the essential medium of its era; augmented reality accelerates the electric video image and holds promise to be the essential medium of our new era. This chapter excavates and diagrams the AR apparatus to search out the repressed in viewers' perception and point a way forward towards an avant-garde augmented reality art.

Chapter 14 "Augmented Reality Painting and Sculpture: From Experimental Artworks to Art for Sale" focuses on a use of augmented reality that is more closely related to traditional painting and sculpture than to interactive game-like AR installations. Based on an analysis of the author's experimental paintings and sculptures, presented in his solo exhibition *Hidden Realities* and the outdoor installation *The Enterprise Jigsaw*, it deals with a particular type of augmented reality paintings that integrate gallery-quality art prints of digital paintings with augmentation by 2D and 3D objects. This type of painting can provide one easy and reliable solution to the acute problem of the saleability of Augmented Reality Art. Alongside theoretical considerations, the first ever augmented reality painting for sale on Amazon is presented—the author's artwork *The Half Kiss*. Similar possibilities for AR sculptures are also analysed.

Chapter 15 "Augmented Reality Graffiti and Street Art" examines the artistic, formal, social and philosophical intersections generated by AR graffiti and street art: the ways by which a digital interface allows us to experience art and urban environments in drastically different ways, and the social and spatial implications that come with such experiences. These intersections are further explored through analysis of two case studies. In addition, two more recent examples are included to assess how AR graffiti has altered in the intervening years since this chapter was first published. What these examples of AR graffiti and street art demonstrate is a renewed analysis of relationships between art, image and environment: in what ways does graffiti and street art facilitate a new or deeper understanding of urban spaces? This updated chapter furthers the idea that although graffiti and street art produced through AR technologies are comparatively benign (to the environment), like other street artists those using AR are required to work closely with the inherent properties of physical spaces and the attendant spatial and social factors attached to them. Unlike more traditional forms however, AR graffiti can utilize the expanded potential inherent to digital technologies to reveal a range of new stories or facilitate alternate readings of urban spatial experiences, alongside the experience of "traditional" graffiti and street art.

Chapter 16 "Face Filters as Augmented Reality Art on Social Media" (a new chapter in this edition) explores the emergence of face filters as augmented reality art. AR "face filters"—a mask-like augmented reality layer that adds virtual objects to an individual's face—have become wildly popular on Instagram, Snapchat and even video calling on Zoom. Up to now, far too little attention has been paid to face filters as a form of AR art. Often seen as play, AR face filters can provide an engaging and personal art experience that allows users to actively participate in creating art online. Further, AR filters enable users to experiment with creating a variety of online identities as self-portraiture. This chapter generates fresh insight into the current trends in AR art on social media. It is likely that AR face filters will radically change how we see ourselves online and how we engage with art in general.

Chapter 17 "Post-Human Narrativity and Expressive Sites: Augmented and Extended Reality as Software Assemblage" examines an influential selection of experimental mobile Augmented Reality Art [ARt] in order to explore the progressive conceptual and ethical threads that are emerging from this relatively new but

powerful cultural form. Using the concept of the "software assemblage," the author traces the movement of AR beyond its native root system in the industrial, entertainment and the engineering worlds, and towards the rhizome of radical practice that has come to define mobile ARt. A number of artists, critical engineers, theorists, historians and participants to AR experiences, have in recent years been contributing to the emergent field of mobile ARt, and significant advances have been made. Clearly, this book is one of them. In the context of the second edition, the author posits the software assemblage concept as an alternative and relational modality through which to converse with ARt.

Part IV "Historical, Cultural and Personal Engagement with Augmented Reality Art" includes 4 chapters (Chaps. 18–21).

Chapter 18 "User Engagement Continuum: From Art Exploration to Remixing Culture with Augmented Reality" states that the most common way to consume art is through observation and acknowledgment of its existence. From the viewpoint of preserving art and cultural heritage, such passive consumption seems adequate. However, throughout history art has always been the subject of endless reinterpretations and its reframing has a possibility to shed new perspectives on the original as well as the reinterpreted context. Novel technologies can enable mash-ups in real time and in the context where art is observed. Augmented reality is one of the most promising by offering the possibility of mixing physical artworks with digitally augmented users' creations or/and curation of personalized exhibitions. In a similar way that the web enabled users to become active participants in content sharing, rating services and products, and deciding on the course of television shows in real time, AR can act as a medium to leave digital augmentation of artworks in real physical spaces and thus support remixing culture with re-appropriation of art. In this chapter, several AR ideas and solutions are presented with a common theme: each allows users to engage with art or cultural heritage in different ways and enables users to tinker with artworks. All presented prototypes can be placed on the *user engagement continuum* that spans from *passive consumption* to *active creation.* The chapter finishes with a discussion of implications such AR solutions would present in terms of copyright violation, curation of user generated content, engagement with technology, ethical issues and others.

Chapter 19 "Rhythms in Stone: Revealing and Augmenting the Human Presence in Mesolithic Rock Art" (a new chapter in this edition) starts with a declaration that the Prehistoric art is the result of a complex phenomenon that includes in addition to the artistic gesture a number of other characteristics. One of them is the rhythm of realization, for which a very eloquent example is the cave art from the caves of the Fontainebleau Forest in France. In order to reveal to the public, the rhythmic and ritual performance of these incisions, an augmented reality application for mobile devices was designed, which allowed the user a fractal presentation of information, starting with the presentation of the geographical context, followed by the interior of the caves and then the action of the performer's ritual. Such information augmentation about prehistoric art has a high educational potential. The "Fontainebleau CaveARt"

application implemented during this research combines location-based with image-recognition AR techniques and was developed with the Wikitude AR framework for JavaScript.

Chapter 20 "Augmenting Wilderness: Points of Interest in Pre-connected Worlds" looks at the way the aesthetics of object-oriented ontology performs in association with augmented reality art made on the borders of Internet connection. The focus of the research is on the notion of "wilderness onticology" by Levi Bryant, and the ideas of "hyperobjectivity" by Timothy Morton, while examining artworks by George Ahgupuk, Alvin Lucier, Mark Skwarek, Nathan Shafer, v1b3 and John Craig Freeman. Most of the conclusions of the research point to the praxis of the art historical anti-tradition as a tool for negotiating ontologies of the wilderness, or the unknown, as well as the virtual objects which exist there, for creating socially useful forms of art. Other topics include the usage of the Earth art binary of site/non-site, media ecology and the flaneur.

Chapter 21 "Really Fake or Faking Reality? The Riot Grrrls Project" traces the evolution of the Riot Grrls App, a proposition applying the inherent possibilities of image-based augmented technology to an historical exhibition of paintings by the Riot Grrrls, a 1990's feminist punk movement, at the Museum of Contemporary Art, Chicago. The intention was to exploit the structural necessities of augmented reality, by conceptually and visually layering-related references in real time, to both poetic and pedagogical ends. To do this, a School of the Art Institute professor and an art historian with expertise in user-experience worked as a team to lead a School of the Art Institute class of young students to create augmented art works using the historic paintings as both augmented triggers but also artistic material. They created inventive formal solutions that engaged museum goers intellectually and aesthetically and were intentionally open-ended.

Finally, we hope that the reader will not judge us too harshly. We have accepted the challenge of being the first, and we have done our best to bring out this pioneering work. Just go ahead and read the book. We hope sincerely that you will enjoy it.

Cairo, Egypt Vladimir Geroimenko

Contents

Part I The Theoretical Aspects of Augmented Reality Art and Technology

1 ART for Art Revisited: Analysing Technology Adoption Through AR Taxonomy for Art and Cultural Heritage 3
Klen Čopič Pucihar and Matjaž Kljun

2 Making Sense of ARt: A Methodological Framework for the Study of Augmented Reality Art 25
Alida Goffinski

3 Why We Might Augment Reality: Art's Role in the Development of Cognition 45
Judson Wright

4 Shifting Perceptions—Shifting Realities—Shifting Spheres 61
Margaret Dolinsky

5 Augmented Reality, the Expansive Object, and the Vivification of the Memory Theatre: Field Notes 75
Michael Rees

Part II Augmented Reality Art and a Variety of Spaces

6 Critical Interventions into Canonical Spaces: Augmented Reality at the 2011 Venice and Istanbul Biennials 97
Tamiko Thiel

7 Merging Spaces: Augmented Reality, Temporary Public Art, and the Reinvention of Site 129
Rachel E. Clarke

8 Data Narratives: Aesthetic Activation of Urban Space Through Augmented Reality 157
Conor McGarrigle and John Buckley

9 Beyond the Virtual Public Square: Ubiquitous Computing and the New Politics of Well-Being 171
Gregory L. Ulmer and John Craig Freeman

10 Augmenting Environmental Graphics in Healthcare Spaces 191
Ian Gwilt, Aaron Davis, Joanne Mignone, Ross T. Smith, and Aprille Chua

11 Augmented Reality Interventions in Shared Space: Subversion and Social Impact 209
Nancy Baker Cahill and Jesse Damiani

Part III Augmented Reality as a Novel Artistic Medium

12 The Aesthetics of Liminality: Augmentation as an Art Form 229
Patrick Lichty

13 Augmented Reality in Art: Aesthetics and Material for Expression 259
Geoffrey Alan Rhodes

14 Augmented Reality Painting and Sculpture: From Experimental Artworks to Art for Sale 269
Vladimir Geroimenko

15 Augmented Reality Graffiti and Street Art 283
Ian Gwilt and Jack Wilde

16 Face Filters as Augmented Reality Art on Social Media 297
Jessica Herrington

17 Post-human Narrativity and Expressive Sites: Augmented and Extended Reality as Software Assemblage 311
Rewa Wright

Part IV Historical, Cultural and Personal Engagement with Augmented Reality Art

18 User Engagement Continuum: From Art Exploration to Remixing Culture with Augmented Reality 331
Matjaž Kljun, Paul Coulton, and Klen Čopič Pucihar

19 Rhythms in Stone: Revealing and Augmenting the Human Presence in Mesolithic Rock Art 349
Dragoş Gheorghiu, Livia Ştefan, Mihaela Moţăianu, and Geir Harald Samuelsen

20 Augmenting Wilderness: Points of Interest in Pre-connected Worlds 367
Nathan Shafer

21 Really Fake or Faking Reality? The Riot Grrrls Project 387
Claudia Hart and Rose Marie May

Concluding Remarks: Today's Vision of an Art Form of the Future 401

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Part I
The Theoretical Aspects of Augmented Reality Art and Technology

Chapter 1
ART for Art Revisited: Analysing Technology Adoption Through AR Taxonomy for Art and Cultural Heritage

Klen Čopič Pucihar and Matjaž Kljun

1.1 Introduction

The world we live in is going through a constant change driven by technological advances. These have the power to revolutionise the way we live in a similar way as personal computers or mobile phones did in the past. Foreseeing which technology has such a potential is nearly impossible, however, it is becoming more and more evident that Augmented Reality (AR) is a good candidate and could have a similar social and economic impact on the shift of the computing paradigm.

However, the development of AR has been mainly pushed by technology, which is not optimal for wide-scale adoption because "*The technology tools are not an end in themselves, but a means to an end*" (Furness 2017). Hence, in the context of technology adoption and development, "*We should ask not only what, but so what!*" (Furness 2017). In order to pursue this goal, AR practitioners and researchers should focus on solving real-world problems based on the opportunities provided by technology and the identification of solvable problems worthwhile addressing. This can propel the development and uptake of any new technology, but pursuing this goal is not easy. In the case of AR, its lure is strong and unique as it enables profound coupling with human senses allowing for generating personalised perspectives in which digital information is being blended with what is coming from the real world. However, this coupling presents in itself a danger as it can interfere with a highly sophisticated human sensing ability of the real world, perfected over millions of years. As Furness highlights, "the mantra of AR should be do no harm" (Furness 2017).

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This chapter focuses on Augmented Reality technology (ART) in the context of art galleries, museums, and cultural heritage sites. The institutions running these sites are highly important as they are preserving, presenting, and communicating the arts and cultural heritage to humanity. However, nowadays, we live in the "time of plenty" where these institutions have to compete for attention and visitor numbers with several other ways of passing time such as entertainment-, edutainment-, or sport-oriented activities.

One of the possibilities to attract visitors to the aforementioned sites is finding the right way of integrating new technologies in ways that will enrich experiences offered. This is particularly important when trying to attract younger audiences. An extensive survey from 2003 has already showed that one third of European museums has already started to experiment with some sort of 3D graphical content (Mohammed-Amin 2015; Wojciechowski et al. 2004). This review resulted in 119 AR applications and/or prototypes for art and cultural heritage. It is thus clear that the institutions running art galleries, museums, and cultural heritage sites are already pursuing this goal. The ultimate goal of these institutions is to present and interpret their collections in appealing and exciting ways, creating experiences that will remain relevant to the modern-day tech-savvy visitors and attract new audiences (Gutierrez et al. 2008; Mohammed-Amin 2015; Wojciechowski et al. 2004). However, the remaining questions are: (i) how good is this adoption and (ii) how well do these institutions utilise opportunities created by advances in AR technology.

In this chapter, we provide an insight into the adoption of AR technology in art and cultural heritage. In pursuit of this goal, we first looked at different AR categorisations/taxonomies, but failed to find an adequate one. We thus propose the activity-based taxonomy method as a tool to provide an insight into technology adoption within a specific domain or context of use. We then use the proposed method to produce the AR Taxonomy for Art and Cultural Heritage (ART for Art and Cultural Heritage). We evaluate the proposed taxonomy and adoption of technology by classifying 119 AR applications in the domain of art, museums, and cultural heritage and discuss the results in light of good practices, missed opportunities, and future developments.

1.2 Activity-Based Taxonomy Method

Activity-based taxonomy method (Table 1.1) is a tool for gaining an insight into technology adoption within a specific domain. The classification of evaluated systems is based on building a model, which describes the domain with a set of domain-specific activities. Based on the model, systems are graded on how well they support each activity of the model. Any system can provide support for many activities; however, scores are only provided for supported activities and have a range from 1 to 3 (e.g. minimal, moderate, high support).

Table 1.1 Activity-based taxonomy schema

	Model			
	Activity 1 support score (1–3)	Activity 2 support score (1–3)	Activity 3 support score (1–3)	…
System 1	Support score (1–3)	Support score (1–3)	Support score (1–3)	…
…	…	…	…	…

Note that scores are only provided for supported activities

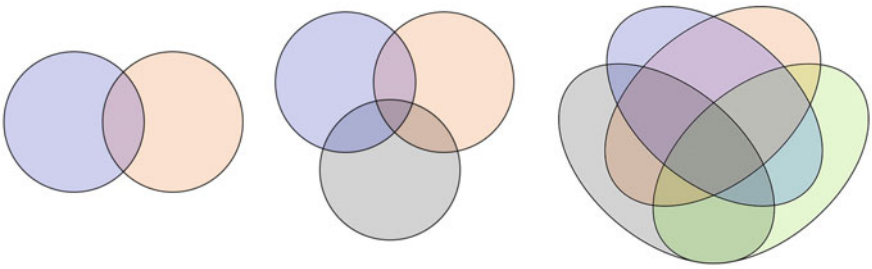


Fig. 1.1 Venn diagrams for 2, 3, and 4 activities

The groups that emerge from the classification can be visualised using Venn diagrams, which change based on the number of activities in the model. Visualisations of a model with 2, 3, and 4 activities can be seen in Fig. 1.1.

1.3 AR Taxonomy for Art and Cultural Heritage

In this section, we utilise the described activity-based taxonomy method in order to build the AR taxonomy for art and cultural heritage. In the first subsection, we propose an activity model of visiting a museum, art gallery, or cultural heritage site, which is then used to generate ART for Art and Cultural Heritage.

1.3.1 Activity Model

The proposed model of activity for visiting a museum, art gallery, or cultural heritage site (MAVM) is based on the MAVM proposed by Tillon et al. (2011). Tillon et al. (2011) based their model on two activities: analytical and sensitive activities. The analytical activity consists of the visitor exploring, dissecting, and objectifying the artwork. In other terms, it consists of contextualising the artwork situated into its

original context. More specifically, this activity consists of precise description (diving into the details the artwork); objectification (placing the artwork into its context of creation within cultural heritage or historical space); and emergence of questions for the future.

The sensitive activity allows visitors to be more sensitive to impressions when viewing a piece of art and is comprised of three types of stimuli: immersion (relates to emergence of the visitor's feelings in the here and now); impregnation (relates to how visitor's feelings while in front of the artwork connect to feelings they experience in their daily life); and imagination (relates to the way the visitor can appreciate the artwork).

We expanded the MAVM of Tillon et al. (2011) by adding two additional activities: the communication and personalisation activities (see Fig. 1.2). Communication activity is a fundamental human activity commonly present when one visits a museum or an art gallery. The communication activity can involve various forms of communication: communication between the institution (e.g. gallery or museum) and the visitor, communication between collocated visitors, and communication between visitors and the outside world (e.g. sharing the visit experience on social networking

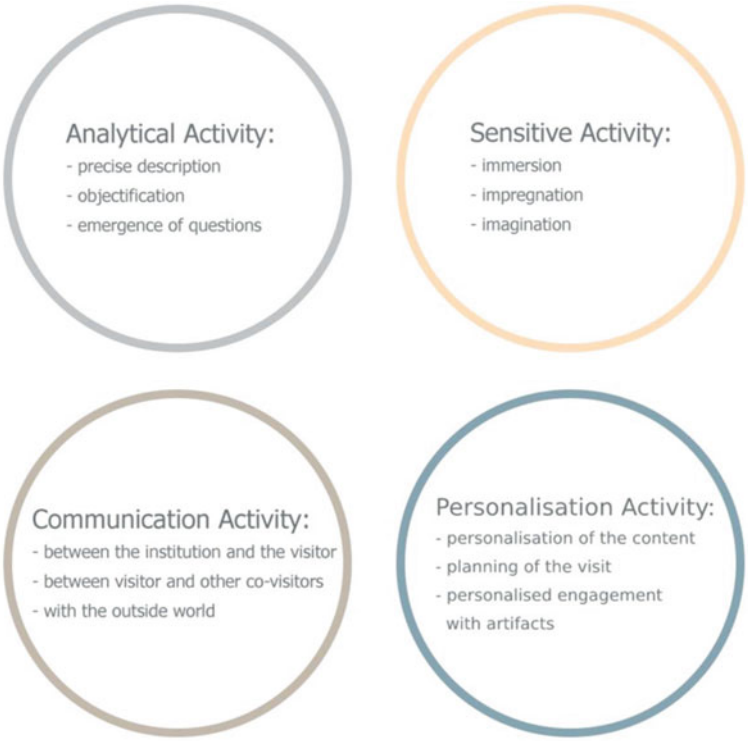


Fig. 1.2 Expanded model of activity of visiting a museum (MAVM). The proposed model complements MAVM proposed by Tillon et al. (2011)

sites). All these types of communication can happen before, during, and after the visit and can be seen as a vital part of a visit to the museum, art gallery, or cultural heritage site.

The personalisation activity can be user induced or automatic. There are many criteria upon which personalisation can occur, such as: personalisation of the content, personalisation of the visit, and personalised engagement with artefacts (e.g. curation of personalised art forms (Čopič Pucihar et al. 2016)). As highlighted by Sevigne and Matisse (Sevigne and Matisse 2007), such personalisation can address personal interests, learning styles, disabilities, age groups, level of initiation, available time for the visit, offline visit planning, or bookmarking.

1.3.2 Taxonomy

AR taxonomy for art and cultural heritage (Table 1.2) is activity-based taxonomy grounded on four activities of the MAVM (Fig. 1.2). To get an insight into technology that is being used, we also add the type of technology to the classifier. Throughout the classification process of 119 AR applications for art and cultural heritage, we identified four (4) different types of AR systems, all of which relate to augmentation of visual senses, namely: handheld AR—a system where display is held in hand or fixed on the stand, but can be manipulated using hands; spatial AR—a system where the environment is augmented by projecting light onto physical structures; mirror AR—a system where the mirrored reflection of the real world is augmented; head mounted display (HMD) AR—a system where the display through which augmentation can be observed is worn on the head of the user (this includes AR glasses).

1.4 Results of Classification

Using the proposed ART for Art and Cultural Heritage, we classified 119 examples of AR applications for art and cultural heritage. This was done in order to evaluate

Table 1.2 AR taxonomy for art and cultural heritage

	Type of technology (handheld, spatial, mirror, or HMD)	Model			
		Analytical activity support score (1–3)	Sensitive activity support score (1–3)	Communication activity support score (1–3)	Personalisation activity support score (1–3)
System 1	…	…	…	…	…
…	…	…	…	…	…

the proposed activity-based taxonomy and gain meaningful insight into the adoption of AR technology in the context of art galleries, museums, and cultural heritage sites.

AR applications were selected through a systematic search for articles on Google Scholar, IEEE Xplore, and ACM digital library. We used a predefined set of keywords and reviewed the first 200 search results selecting the ones where AR applications were presented within the paper. In the case of review papers, we explored referenced work in search of AR applications. Through the selection process, we decided to also include applications with descriptions only published at various websites. This was done in order to get a better understanding of what is used within galleries and museums outside the research domain.

The scoring and categorisation were done individually by both authors of this chapter. The scores were then compared and discussed in order to obtain a unanimous decision on the final score presented in Table 1.3. It is important to note the authors did not score how novel or technically advanced reviewed systems are, but focused on how well the systems support activities of the MAVM from user's perspective. It is also important to note that in the case of sensual activity, immersion is a very important factor; hence, high-quality rendering and the setting/environment in which the system was deployed could not be separated from the obtained score. To sum up, irrespective of all efforts to objectify the obtained classification scores, the results presented in Table 1.3 are subjective in nature. Nevertheless, they still provide valuable insights into adoption of AR technology.

The data in Table 1.3 is summarised by a Venn diagram that visualises the groups based on classification results (see Fig. 1.3). In the following two subsections, we further analyse the results of classification using descriptive statistics (Figs. 1.4, 1.5,

Table 1.3 Classification table of AR taxonomy for art and cultural heritage

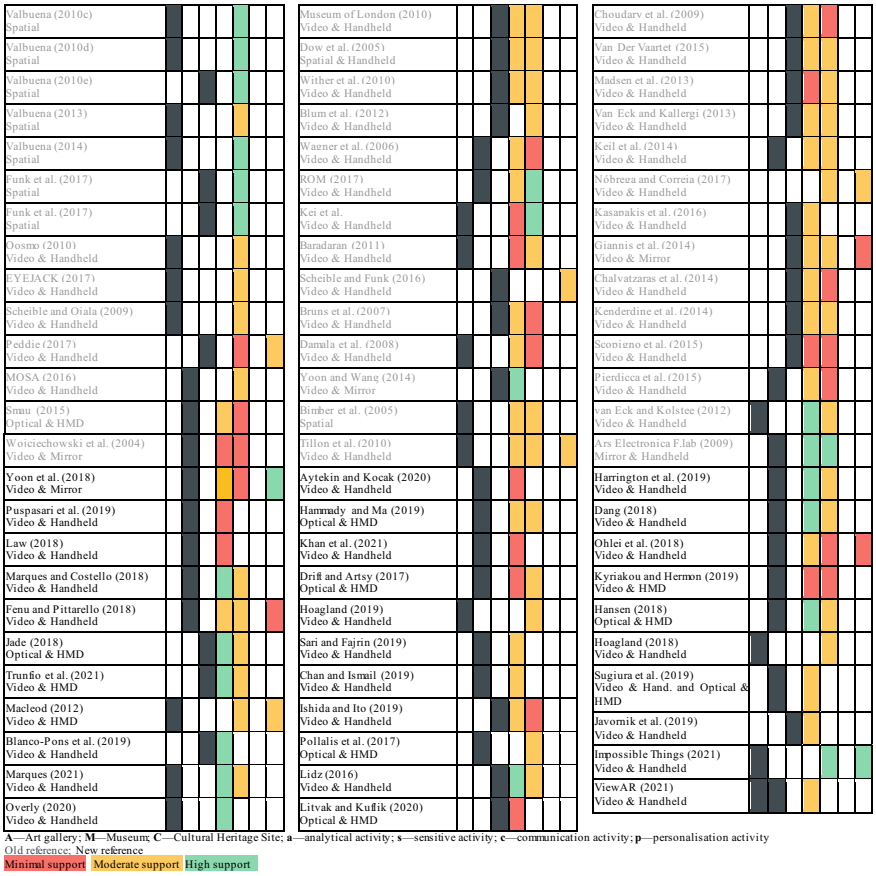
Reference and technology	A	M	C	a	s	c	p
Jean-Michel et al. (2010) Video & On Stand		■		■	■		
Jean-Michel et al. (2016a) Spatial		■		■	■		
Jean-Michel et al. (2015a) Video & Handheld		■		■	■		
Jean-Michel et al. (2016b) Video & Handheld		■		■	■		
Jean-Michel et al. (2015b) Video & Handheld		■		■	■		
Jean-Michel et al. (2015c) Spatial		■		■	■		
Jean-Michel et al. (2015d) Spatial		■		■	■		
Jean-Michel et al. (2015e) Spatial		■		■	■		
Jean-Michel et al. (2013) Video & Handheld		■		■	■		
Jean-Michel et al. (2011a) Spatial		■		■	■		
Jean-Michel et al. (2011b) Video & Handheld			■	■	■		
Jean-Michel et al. (2011c) Spatial			■		■		■
Valbuena (2010a) Spatial			■		■		
Valbuena (2010b) Spatial			■		■		
Valbuena (2004) Spatial			■		■	■	

Reference and technology	A	M	C	a	s	c	p
Střelák et al. (2016) Video & Handheld			■	■	■		
Keil et al. (2013) Video & Handheld	■			■	■		
Miyashita et al. (2008) Video & Handheld	■			■	■		
Schmalstieg and Wagner (2007) Video & Handheld				■	■		
Bostanci et al. (2015) Video & Mirror	■			■	■		
Caarls et al. (2009) Spatial	■			■	■		
Han et al. (2013) Video & Handheld			■	■	■		
Gilroy et al. (2008) Video & Handheld				■	■		■
Weiquan Lu et al. (2014) Video & Handheld	■			■	■		
Kennedy et al. (2005) Video & Mirror			■	■	■		
Tillon et al. (2011) Video & Handheld	■			■	■		
Vlahakis et al. (2002) Optical & HMD	■			■	■		
Tanasi et al. (2012) Video & Handheld	■			■	■		
Thian (2012) Video & Handheld	■			■	■	■	
Lee et al. (2012) Video & Handheld			■	■	■		

Reference and technology	A	M	C	a	s	c	p
Benko et al. (2004) Video & HandheldMD			■	■	■		
Chatzidimitris et al. (2013) Video & Handheld			■	■	■		
Keil et al. (2011) Video & Handheld			■	■	■		
Zoellner et al. (2008) Video & Handheld			■	■	■		
Madsen et al. (2012) Video & Handheld			■	■	■		
Damala et al. (2012) Optical & HMD			■	■	■		■
Zöllner et al. (2009) Video & On Stand	■			■	■		
Herbst et al. (2008) Video & HMD			■	■	■		
Lochrie et al. (2013) Video & Handheld			■	■	■		
Coulton et al. (2014) Video & Handheld				■	■		■
Čopič Pucihar et al. (2016) Video & Handheld	■			■	■		■
Seo et al. (2010) Video & Handheld		■		■	■		■
Kourouthanassis et al. (2015) Video & Handheld			■	■	■		■
Cheok et al. (2002) Video & HMD				■	■		
Balduini et al. (2012) Video & Handheld			■	■			■

(continued)

Table 1.3 (continued)



and 1.6). Due to the subjective nature of results, we decided not to run statistical analysis on the gathered data, but instead focus on highlighting good practices from reviewed applications.

1.4.1 Context of Use and AR Technology

Results in Fig. 1.4 show that the majority (47%) of applications were deployed to cultural heritage sites. However, in recent years, there has been a slight increase of deployed systems to museums (the portion has increased from 22.9% in the 2004–2017 (early) period to 32.8% in the 2004–2021 (full) period), while the portion of AR applications used in cultural heritage sites decreased by 7.3%. Despite this decrease, AR applications deployed to cultural heritage sites still hold the largest share.

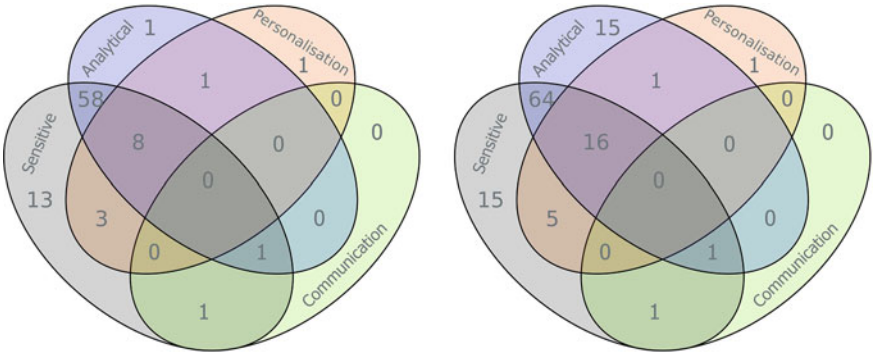


Fig. 1.3 Visualisation of classification based on AR taxonomy for art and cultural heritage in Table 1.3. Left graph shows data for the 2004–2017 period (early). Right graph shows data for the 2004–2021 period (full)

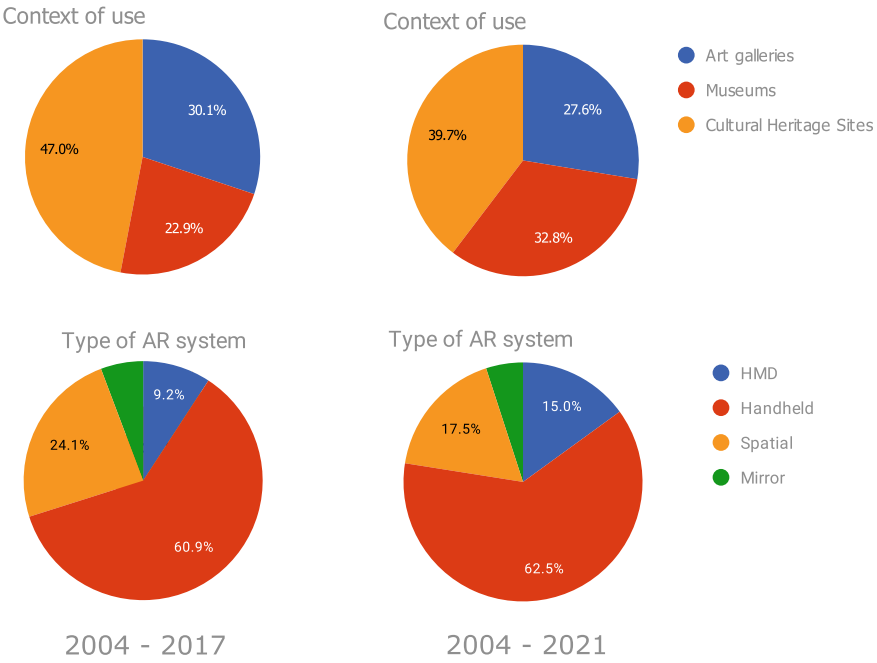


Fig. 1.4 Descriptive statistics: top row shows in what context most applications were used; bottom row shows what type of AR system has seen highest adoption; columns show data for different time periods

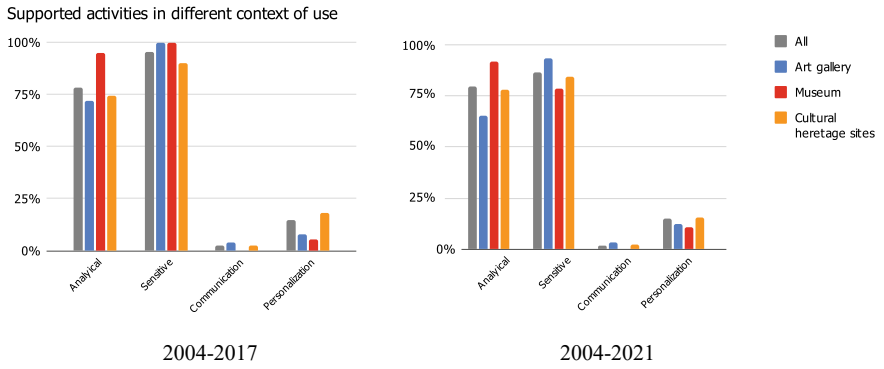


Fig. 1.5 Percentage of applications supporting individual activities of MAVM for different context of use for two different time periods—early and full

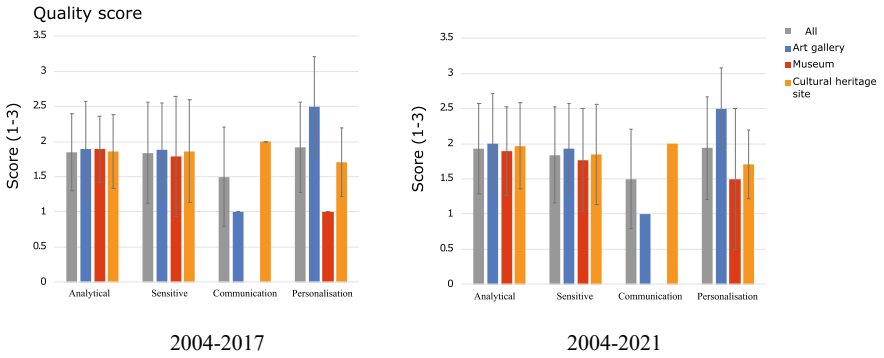


Fig. 1.6 Average support quality score for both time periods

Handheld AR is currently the most popular system used (61%). This result is not surprising since handheld AR applications are mobile solutions and are ideal when deploying technology to an outdoor setting (as is commonly the case in cultural heritage sites). Additionally, devices that are capable of running handheld AR applications are widely available, which further contributes to the popularity of handheld AR systems. However, handheld AR systems are faced with limitations in their ability to immerse the user into the augmented world.

From the perspective of MAVM, immersion is a very important element when considering sensitive activity. This is probably one of the key reasons for high percentage of spatial AR applications (24%), which can provide highly immersive experiences, but are plagued by the difficulty and cost of setting up as well as the limitation in regard to illumination levels (e.g. cannot work in brightly lit environments). We thus see these augmentations mainly as installations in art galleries (Valbuena 2014; Valbuena 2010c, 2010d, 2010e, 2013) and museums (Jean-Michel et al. 2011a, 2015c, 2015d, 2016a). Nonetheless, spatial augmentations of buildings and cultural

heritage sites are also becoming more common (Funk et al. 2017; Jean-Michel et al. 2011c; Valbuena 2004, 2010a, 2010b).

However, in recent years, the number of spatial AR applications has decreased by 6.4%, which is likely the result of the availability of HMD technology with the off-the-shelf HMD AR devices (e.g. HoloLens, HoloLens2, Magic leap). Yet, it is important to note the adoption of these HMD technologies has largely stayed confined to the research community. Therefore, we have yet to experience the adoption of HMD within the museum settings at the scale of spatial and handheld AR systems. The HMD AR systems remain expensive, difficult to deploy and obtain outside of the research context. However, the immersive potential of HMD AR systems greatly surpasses that of handheld AR systems. As the technology progresses, miniaturises, and becomes readily available, these systems are likely to gain wider adoption.

In the case of mirror AR, users cannot interact with the world while looking into a mirror. Hence, the number of use cases where such setups make sense is small. This explains why mirror AR configurations are only marginally used. However, when such use cases can be foreseen, this metaphor can be very powerful.

1.4.2 Activity Support

The graph in Fig. 1.5 shows the percentage of applications that support an activity from MAVM. Theoretically, an ideal application would support all activities; however, this may not always be beneficial and might depend on the context or purpose of the application. Nonetheless, the results clearly show general lack of support for communication and personalisation activities across all contexts of use. This is the case for both time periods (early and full) and suggests that the adoption of AR technology in recent years did not manage to sufficiently progress in the direction of materialising its full potential. We believe there are many ways in which currently adopted technology could be utilised to support communication and personalisation activities. These will be presented in the following section where we discuss each supported activity individually.

The graph in Fig. 1.6 shows average quality score of activity support with standard deviation (note that only supported activities received a score from 1 to 3). Overall, (grey plot) all average scores are smaller than mid-score, (2) while communication activity scored lower than others. This suggests that on average, the quality of support for MAVM activities is low; hence, the technology adoption is not taking full advantage of technological development. Nevertheless, a slight increase in the quality score within the full period (2004–2021) can be observed, which suggests an improvement. However, based on a relatively high standard deviation, it is difficult to make any final conclusion. Nevertheless, the high standard deviation suggests there ought to be applications which do a good job in supporting MAVM activities. In the following sections, we thus highlight good examples selected from reviewed applications in Table 1.3.

1.4.3 Analytical Activity

Magnetic Maps (Yoon and Wang 2014) is a good example of supporting analytical activity, because it enables the user to experiment with invisible forces of magnetic field using a tangible interface with tactile feedback. This is achieved by augmenting real bar magnets that provide the interface for visualisation of the magnetic field. Even if the principle used in Magnetic Maps is not easily transferable to other situations, it demonstrates how learning by doing with AR can make for excellent support of analytical activity. It also highlights the importance of multimodality of the interface that actually enhances the quality of the experience.

House of Olbrich (Keil et al. 2011) is another example of good analytical support. The application enables the user to create a snapshot of the cultural heritage site (e.g. a building facade) from an arbitrary point of view and precisely overlays the captured image with additional information even in difficult outdoor lighting conditions. High precision of augmentation enables easy mapping of provided information to the real world. In addition, the application designers intentionally decided to overlay augmentations in a stylised form as sketches made by architects. This makes it easier for the user to grasp different facade features and highlights that realistic rendering is not something that should be pursued in all AR scenarios.

A more recent example is application Overly (2020), which is used by Latvian National Museum. The application enables visitors to gain additional insights about the painting beyond general information usually available in museums. The application enables users to select a part of the painting in order to extract further details about that particular area with the content that has been pre-annotated by museum experts. As Overly is a platform, it is relatively easy and cost-effective for the museums to deeply, yet as this platform supports only a limited set of functionalities, without the ability for expansions, it limits how the museum uses AR technology, the view we share with (Yılmaz and Apilioğulları 2021).

Another interesting application is Skin and Bones (Marques 2021), which is used in the Natural history museum in Washington D.C. This application is a good example of taking the full advantage of the rich space the museum offers. The application overlays bones and tissues over skeletons or places live animals besides stuffed ones. This excites visors and motivates them to engage further with the available content within the app and the museum per se.

1.4.4 Sensitive Activity

Holoman by Ars Electronica Futurelab (Ars Electronica Futurelab 2009) is an example of an application supporting analytical as well as sensitive activity. Holoman enables the user to hold a mirror in hand and explore the internal working of their body. As user do not see the reflection of themselves as such, but only a heavily mediated representation of the body, any errors in the alignment of the augmentation

are unlikely to break the illusion of looking inside their own body. This in turn creates better immersion contributing to analytical and sensitive experience.

In (Weiquan et al. 2014), the artists created animations instead of text descriptions of their paintings in order to help visitors in analytical and sensitive deduction of artworks. These animations are then overlaid over paintings in the gallery when pointed at using a handheld device. The results show that this type of learning is effective and highlight the importance of high-quality augmentations, which were in this example done by the artists in the style of the painting itself. The latter is particularly important in supporting sensitive activity.

In ARART (Kei et al. 2012), the application brings famous paintings to life through animation. By controlling the lighting in the exhibition space and by creating high-quality animations tuned to the lighting condition of the exhibition, the authors managed to achieve excellent mixing of animated content with the environment offering good support for sensitive activity. This example also highlights how important the quality of augmentation is, particularly for sensitive activity.

A similar application to ARART is Reblink, which is used in the Art Gallery of Ontario, Toronto. It gives life to their art pieces, which can move in 3D, change their posture, and even enable the user to take come together with them in the painting. The application not only supports the sensitive activity, but through taking and sharing photographs, it supports the communication and personalisation activities we further discuss in the following sections.

1.4.5 Communication

Except for Reblink, none of the reviewed applications demonstrated good support for the communication activity. Hence, we see this as a great opportunity that has been overlooked so far by institutions running art galleries, museums, and cultural heritage sites. The communication activity is becoming ever more important for the tech-savvy society as more and more people readily record and share their everyday experiences. Therefore, the aforementioned institutions should focus on finding the right way to integrate social networking sites into AR applications while exploiting AR communication potential (e.g. context-aware bookmarking, sharing the visit experience of "I was here", support artistic expression by enabling curation of augmentation for exhibited artefacts).

1.4.6 Personalisation

From reviewed applications, there are two examples of our previous work that offer the personalisation potential. Taking artwork home is a handheld AR application that focuses on supporting personalisation activity (Coulton et al. 2014) by enabling users to curate personal art exhibitions in their home by replacing existing paintings

with the ones provided by the Peter Scott Gallery (Lancaster, UK). The exhibitions are shared with other users of the platform also providing a sort of communication channel through user-curated exhibitions.

Playing with the artworks (Pucihar et al. 2016) is another prototype supporting personalisation activity by enabling gallery visitors to curate personalised versions of the exhibited artworks by colouring printed puzzles, which are used to generate a texture map of a 3D sculpture or 2D painting. This enables personalised interaction with exhibited artefacts and also creates a sort of communication channel by sharing the curated content with the museum and other visitors. This type of personalisation was also supported by Reblink, which enabled visitors to take their picture with characters portrayed.

Despite uncovering some examples of personalisation, there is a general lack in supporting personalisation. Together with communication activity, personalisation provides an untapped potential and opportunity for art and cultural heritage institutions to further explore and exploit to their advantage.

1.5 Conclusions

The goal of this chapter is to gain an insight into the adoption of AR in art and cultural heritage to reflect on future opportunities or highlight the missed ones. In pursuit of this goal, we propose an activity-based taxonomy model, which can be used to gain an insight in adoption of arbitrary technology and is based on formulating activity model for the context of technology use.

We utilised the activity-based taxonomy to generate AR taxonomy for art and cultural heritage. The context of technology use in our case is the activity of visiting a museum, art gallery, or cultural heritage site. In this process, we proposed an expanded Model of Activity of Visiting a Museum, art gallery, or cultural heritage site (MAVM) originally proposed by Tillon et al. (2011). Using the proposed AR taxonomy for art and cultural heritage, we classified 119 relevant AR applications and gained the following insights into technology adoption: (i) general lack of support for communication and personalisation activities persist; (ii) the quality of adoption remains below the satisfying level, yet some improvements have been made within the past few years; (iii) despite limited immersion capacity, handheld AR systems persist to be the most commonly used systems; and (iv) irrespective of difficult and costly setups, a substantial proportion of systems is spatial AR systems, yet this ratio recently dropped due to higher adoption of head-mounted display systems, but still largely limited to the research domain.

To sum up, the proposed activity-based taxonomy model generated a meaningful AR taxonomy for art and cultural heritage. The results of calcifications provided insights into technology adoption highlighting prominent avenues for future improvements.

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Chapter 2
Making Sense of ARt: A Methodological Framework for the Study of Augmented Reality Art

Alida Goffinski

2.1 Introduction

The study of augmented reality art (henceforth ARt) is an inherently ephemeral project. Given the speed with which AR technology is evolving as a creative medium, the proliferation of AR in practice is outpacing the research methods that attend to its specificity. How do we make sense of, and derive meaning from, works of ARt? And what's at stake in the course of this intellectual project?

As digital art scholar Christiane Paul observes, "Technologies often tend to develop faster than the rhetoric evaluating them, and we constantly have to develop vocabulary for art using digital technologies as a medium—in social, economic, and aesthetic respects" (Paul 2015, p. 67). Paul continues, "The characteristics commonly assigned to the digital medium need some further clarification since they are often used in such a general way that they hardly carry any meaning" (Paul 2015, p. 67). Terms like "interactivity" or "immersion" for instance are beginning to lack analytical substance as the digitally mediated world with which we are entangled increasingly feels like water to a fish. Currently, the range of experiences that join the physical and the digital to constitute the spectrum of extended reality (XR) is evolving at a pace that strongly supports Paul's point. We are inclined to bundle these experiences under encompassing terms like "XR" and are less likely to reflect on the phenomenological distinctiveness of such constitutive experiences on their own terms. At this juncture, the phenomenon of virtual reality (VR) has arguably garnered more research along these lines.

In practice, however, the immersive experience afforded by a work of ARt is not tantamount to a virtual reality experience. Though deep affinities are undeniable, we have an opportunity to further develop the phenomenological vocabulary we use to articulate the experiential grammar that distinguishes an augmented experience

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from a fully immersive, virtual experience. Doing so opens up the potential for deeper investigations of the potentialities of augmented reality in particular, and its aesthetic, social, and political implications. If we adopt a human-centered perspective and follow the creators who leverage this technology, we see that they use AR to do far more than embellish their living rooms with furniture or enhance their faces with filters. Rather than asking ourselves what AR technology will be capable of in one, five, or ten years, I wonder what we've already overlooked about the inaugural wave of ARt with our analytical gazes turned so expectantly toward the future.

In response, this chapter provides a medium-specific methodological framework for the study of ARtworks, from a perspective I term "critical sensory ethnography," drawing on the work of Sarah Pink (Pink 2015a, 2015b; Pink et al. 2016, 2020) and D. Soyini Madison (2005). By combining the work of these two scholars—neither of whom directly engage with the technology of AR—I extend their ethnographic commitments to the study of augmented reality experiences. Throughout this chapter, I seek to problematize an apolitical conception of immersive experience. Rather, I suggest that the form of immersive experience afforded by augmented reality is a socially and politically salient form of embodied knowledge that demands ongoing, critical ethnographic study. By adopting an ethnographic approach to the study of AR, I assume that our understanding of augmented reality art would be further enriched by conceptualizing ARt as an emerging avant-garde, creative *practice* enacted by human beings as they make sense of their lived experiences through technology. Rather than bracketing the ARtist to pursue disembodied studies of ARtworks in analytical or theoretical vacuums, I argue we have much to learn from centering the perspective and expertise of ARtists *qua* practitioners of an emerging form of embodied knowledge. Our point of departure can thus be summarized by several overarching questions to guide the study of ARtistic practices:

(1) What kind of *practices* are ARtists enacting or contributing to in our contemporary moment?
(2) What sensory, somatic, semiotic, cultural, and political *categories* do ARtists rely on, reflect on, manipulate, subvert, play with, or generate through the augmented aesthetic experiences they create?
(3) What are the conceptual, formal, and experiential *conditions* that ARtists mobilize to facilitate contemporary, augmented aesthetic experiences?
(4) And finally, how do ARtists use the technology of AR to *reimagine* or *protest* their physical realities through ARt practices?

Indeed, the questions outlined above are not exhaustive. The methodological approach that follows will be most beneficial to scholars and practitioners in the fields of digital sociology, anthropology, user experience research and human–computer interaction, media studies, and performance studies. Additionally, this framework is intended to equip academic and industry researchers with a model for the ethnographic study of augmented reality art that I invite them to modify, reinterpret, and extend according to their own objectives, expertise, and ethnographic intuition.

2.2 Nouveaux Instruments

What, precisely, is at stake when we undertake a medium-specific approach to the study of augmented reality art? This question confronts us, in some variation, each time a new medium starts to make its mark on us throughout history. In response, new media scholars often argue that a salient dimension of any new medium is its ability to facilitate *new experiences* for its users and audiences (Lovejoy et al. 2011; Paul 2015). Indeed, the architecture of media studies scholarship is constituted by the work of thinkers like Walter Benjamin who argued that media play a central role in experiential transformations over time. Jaeho Kang summarizes Benjamin's commitments along these lines:

> The question of the human experience of media and how the media themselves transform experiences is fundamental to Benjamin. New media then shape the human perceptual capacities and faculties, and undergird new forms of embodied experience. Media, then, are not simply visual or oral, or literary forms, but reconfigure the entire human body, our sensory apparatus: in other words, media technological transformation, the transformation of the body, and its relation to space and time are intimately interconnected. New media produce new perceptual possibilities, new bodies and new subjectivities (Kang 2014, p. 213).

In a similar vein, Marshall McLuhan argued that artists possessed a privileged perspective in societies undergoing such perceptual transformations. He suggests, "The effects of technology do not occur at the level of opinions or concepts, but alter sense ratios or patterns of perception steadily and without any resistance. The serious artist is the only person able to encounter technology with impunity, just because he [*sic*] is an expert aware of the changes in sense perception" (McLuhan 1964, p. 31). Thus, the perspective of the new media artist/creator is a promising starting point as we seek to comprehend ARt practices and their relationship to what McLuhan refers to as "sense ratios," or perceptual patterns, as they transform through time.

Contemporary scholars continue to build on McLuhan's concept of "sense ratios" to pursue investigations of technologically mediated embodied experience. The work of Ingrid Richardson (2005, 2010, 2011, 2020) provides a phenomenological, medium-specific account of our embodied interactions with new media, specifically mobile technologies. Drawing on Merleau-Ponty's (2002, p. 145) classic argument that habituating oneself to the objects in our midst "expresses the power we have of dilating our being in the world … of altering our existence through incorporating new instruments [*nouveaux instruments*]," Richardson considers the embodied practices that habituate us toward contemporary, mobile media devices. Richardson explores how such technologies demand a new range of collective bodily skills, spatial perceptions, postures and habits, arguing that a medium-specific approach centralizes the distinctive spatial, temporal, and socio-cultural effects of a particular medium that determine "particular conditions of possibility for the way meaning is made" (Richardson 2010, 2020). Richardson proposes a medium-specific approach to the study of Merleau-Ponty's *nouveaux instruments* that phenomenologically probes the conditions of collectively shared forms of knowledge as they are performed into being in situ. Importantly, Richardson's program moves beyond McLuhan's sense

ratios to include the role of culture, history, and the situatedness of knowledge with the more relational concept of "technosomatic involvements" (Richardson 2010). Drawing on the applied, post-phenomenological approach of philosopher Don Ihde (1990) Richardson calls for additional ethnographic studies of embodied knowledge practices that illustrate the technosomatic arrangements that new media demand across cultures and contexts.

Richardson's notion of technosomatic involvements exemplifies the hermeneutic phenomenological principle that the "macro," is constituted by "micro" practices and invites us to interrogate the theoretical distinction that artificially separates these two deeply interrelated domains of lived, embodied experience. What is at stake, therefore, as we undertake the study of *nouveaux instruments* is the technologically mediated transformation of "common sense" itself—knowledge that is at once deeply personal, tacit, and individually embodied, as well as socially and culturally salient. Following such transformations ethnographically enables us to more fully comprehend how knowledge and meaning are produced by and through ever evolving, technosomatic means.

2.3 Making Sense of the Senses

Ethnographic studies of embodied knowledge practices can be traced back to the origins of the anthropological and sociological disciplines, with the role of the senses occupying varying levels of significance. In the past three decades, the related "material," "sensory," and "performative" turns have sparked intellectual debates concerning divergent approaches to the study of human experience and knowledge production—with semiotic, linguistic, largely representational studies occupying one extreme, and material, sensory, extralinguistic approaches at the other.

The latter position has been defended by select scholars affiliated with the interdisciplinary field of "sensory studies," which takes the human "sensorium" as its primary object of study. Derived from the Latin *sensus*, (the faculty of perceiving), the concept of the sensorium emerged in the seventeenth century to describe the totality, or seat, of sensory perception. The interdisciplinary field of sensory studies is broadly concerned with the study of the sensorium as the dynamic interplay and organization of our perceptual processes mediated by our social, physical, and cultural environments (Howes 1991; Jutte 2005). Anthropologist David Howes and cultural historian Constance Classen explain, "[S]ense perception is not simply some precultural, psychophysical 'information-gathering' process. Our ways of sensing and making sense lie at, and indeed give form and life to, the heart of culture" (Howes and Classen 2013, p. 13). Though not a homogeneous subfield, this approach tends to advance the human sensorium as an analytical concept warranting further anthropological study—much like kinship, economic, or religious systems—to facilitate cross-cultural comparison.

While sensory studies scholarship contributed important challenges and nuance to the intellectual debates of the early twenty-first century, it is increasingly common

for today's ethnographic scholarship to demonstrate that—in practice—a *rapprochement* between the sensory and the semiotic can produce fruitful accounts of lived, embodied experience. In this way, the initial wave of sensory studies scholarship has since been reinterpreted by contemporary ethnographers. For our purposes, the "sensory ethnographic" approach outlined by anthropologist Sarah Pink provides us with the methodological foundation needed to attend to both the material and semiotic domains of augmented reality artistic practices. Pink invites the ethnographer to consider forfeiting the mind/body dualism that fragments prior studies of human experience to pursue a more holistic approach to ethnography. Such an approach is a direct response to calls of scholars like Mitchell (2005) who assert that Western ocularcentrism and the reification of "the visual," have left us with a limited understanding of our interrelated sensory and semiotic ratios. Pink's work reminds us that the distinction between the cognitive and sensory categories available to our research participants are equally important sources of knowledge whose separateness is defended more stringently within academic debates than in our participants' lived experiences.

2.4 Sensory Ethnography

Extending the initial wave of sensory studies scholarship, anthropologist Sarah Pink's "sensory ethnography" relocates the analytical position of the senses in ethnographic analysis, departing from prior, specialized anthropological accounts (Pink 2015a, 2015b). Pink explains, "In my own work, [the senses have] become part of an approach, rather than being the central strand of a study. This I believe is a shift that needs to happen, so that attention to the senses becomes part of ethnographic practice, rather than the object of ethnographic study" (Pink 2015b, p. 13). Pink's sensory ethnography, therefore, is a less of a specialized program, but more of a methodological posture that assumes the sensorial (she prefers the term "*multi*sensorial") dimension of human experience is salient to ethnographic inquiry generally. Rather than abstracting the sensorium as an object of study, the multisensorial dimension of lived experience permeates the ethnographer's outlook entirely.

A sensory ethnographic perspective, then, supplements traditional ethnography with a more expansive definition of what is typically regarded to constitute legitimate ethnographic "data." Pink suggests that the ethnographic interview and participant observation—the primary ethnographic methods—be reconceptualized as *multisensory* events. Rather than supplant traditional ethnography, Pink deepens extant approaches by insisting that we overlook important sources of ethnographic knowledge if cursory analytical attention is paid to "sense-data," whether they be quotidian or highly significant to our participants. The sensory ethnographer conducts close, qualitative studies of human experience that attend to multisensorial, atmospheric, and embodied forms of meaning-making via interviews and observation, but analysis does not simply culminate in the reconstruction of a culture's sensorium. Importantly, Pink also embraces the semiotic and cultural codes that human beings draw upon

to imbue experience with meaning. In this way, Pink invites ethnographers to take full advantage of all sources of knowledge and meaning available to us, and to our research participants, to pursue novel, creative accounts of the way that the spoken and tacit dimensions of experience contribute to meaning-making. The resultant sensory ethnographic findings carefully articulate how these dimensions work in tandem as participants make sense of their lived experiences and practices.

In her related work on ethnographic studies of the digital, Pink observes that sensory approaches are gaining in currency in part due to the ways in which the digital is increasingly entangled in everyday experience (Pink et al. 2016). I suggest that Pink's holistic, multisensorial analytical posture, coupled with her refusal to center the sensorium as our primary object of study yields new analytical possibilities in our postdigital moment. With Pink, I am not invested in merely abstracting and reconstructing the human sensorium as our chief analytical objective, nor do I seek to merely confirm that the increasingly digital human sensorium has undergone transformations through time. Following the analyses of early scholars like Benjamin, McLuhan, and Merleau-Ponty, and contemporary thinkers like Don Ihde (1990), Mark Hansen (2006), Ingrid Richardson (2020), and Richard Grusin (2015), I assume it is no longer contentious—or novel—to argue that the contemporary human experience is co-constituted by and through digital media. My reading of Pink, therefore, embraces her invitation to pursue more ambitious questions about the experiential conditions of meaning-making, including her argument that a sensory ethnographic approach might illuminate new sensory categories, and shed new light on emerging forms of embodied knowledge and practice. Pink's invitation reminds us that ethnographers need not wait for emerging knowledge practices to become hegemonic or dominant before we study them. Given the rapid evolution of AR technology, Pink's approach is well positioned to follow the emergence of ARt as a bourgeoning, creative practice.

By conceptualizing augmented reality art practices in this way, we pursue a framework for the study of augmented reality that is at once medium-specific—and yet—is not necessarily media-*centric*. We do not assume that the technology of AR serves the same function, or takes priority, in the lives and practices of all ARtists and creators. With Pink, we adopt human-centered principles from the fields of user experience research and human–computer interaction (HCI) to explore technology through the first-hand experiences of human beings (Norman 2007, 2013). Along these lines, the ethnographer is discouraged from making a priori assumptions that the technology in question is essentially good or bad for its users, or that the technology "feels" particularly salient or interesting to the research participant. Instead, we proceed inductively and carefully through ethnographic interviews and participant observation into the lifeworlds of our research participants to uncover the kinds of experiences and possibilities a given technology affords them. This includes the range of unanticipated benefits, consequences, and functions of the technology under investigation.

To summarize thus far, the ethnographic perspective I seek to advance for the study of ARt proceeds from the methodological foundation provided by Pink's sensory ethnographic approach, but does not amount to it. Pink's commitments to a more

robust ethnographic outlook that takes seriously the semiotic and sensory data generated throughout the course of multisensory ethnographic interviews and participant observation are excellent starting points. Further, Pink's human-centered approach to digital ethnography can be read as an important invitation to researchers to be reflexive about their personal attachments or biases related to the technologies they investigate. In order to more fully attend to the range of empirical practices that ARtists enact through AR, however, we must supplement Pink's perspective with an ethnographic approach that specifically addresses questions of power and inequality in phenomenological terms.

2.5 A Critical Supplement to Sensory Ethnography

Though augmented reality art is colloquially associated with the spectacle of Pokémon Go, or the Snap and Instagram filters that punctuate our social feeds, a notable, though vastly underexplored, impulse runs throughout what we might term the "first wave" of augmented reality art. Since the early work of the inaugural augmented reality art collective Manifest.AR, artists and creators have used AR to generate ARt that explores themes of power, cultural identity, gender, race, climate change, and critical history. Years before Pokémon Go launched AR into the mainstream, the collective pioneered the use of ARt as a form of activism—protesting cultural elitism by infiltrating the MoMa, and raising climate change awareness by illustrating glacial recession, among other interventions.[1] Though their work is peripheral to the mainstream, commodified forms of augmented reality experiences that are currently on the rise, these avant-garde practices are central to the genealogy of augmented reality technology. The first wave of socially and politically engaged ARtworks they have produced arguably constitutes an important dimension of the ARtistic canon.

As AR continues to make its way into mainstream channels of e-commerce, education, entertainment, and gaming, we would be remiss to overlook the cadre of ARtists who consistently produce work beyond these traditional domains. Today's rising cohort of ARtists use AR to protest police brutality, assert their cultural identities, and illuminate marginalized histories. This ongoing work invites questions regarding how ARtists use AR to imagine more socially and politically just realities at the phenomenological level. In McLuhan's terms, we might ask—what is it about the *medium* of AR that is conducive to the social, political, and global *messages* ARtists seek to advance? To further adapt our methodological framework to account for such questions, we now consider the work of anthropologist D. Soyini Madison (2005).[2]

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[1] I wish to thank the members of the Manifest.AR collective who have generously shared their work and perspectives with me. See co-founder Mark Skwarek's (2014) chapter, "Augmented Reality Activism" for a comprehensive introduction to the collective's work and objectives.

[2] I wish to thank Professor Kemi Adeyemi for introducing me to Madison's seminal work.

By joining Pink's multisensorial analytical posture with Madison's (2005) *Critical Ethnography: Method, Ethics and Performance*, we pursue an ethnographic approach that more comprehensively engages the relationship between phenomenology and politics. Madison's work is constituted by two critical themes that I consider germane to the study of ARt practices: (1) the politics of researcher positionality and (2) phenomenology's relationship to the political. In contrast to Pink, Madison's approach advances a more expressly critical account of the ethnographic researcher and of human subjectivity more broadly. Madison routinely opts to refer to the ethnographer's *positionality*, rather than their subjectivity, to underscore the relational nature of ethnographic presence.[3] Madison invites ethnographers to:

> [C]ontextualize our own positionality, thereby making it accessible, transparent, and vulnerable to judgment and evaluation. In this way, we take ethical responsibility for our own subjectivity and political perspective, resisting the trap of gratuitous self-centeredness or of presenting an interpretation as though it has no "self," as though it is not accountable for its consequences and effects. Doing fieldwork is a personal experience. Our intuition, senses, and emotions—or what Wallace Bacon (1979) collectively refers to as "felt sensing"—are powerfully woven into and inseparable from the process (Madison 2005, p. 8).

Madison's distinction between a reflexive, vulnerable acknowledgment of one's positionality on the one hand, and an indulgent, self-centeredness on the other, is salient. Madison urges the researcher to take responsibility for their presence and interpretations throughout the stages of data collection, analysis, and reporting. Where the ethnographer veers into self-gratuitous territory, somewhat paradoxically, is when they fail to acknowledge their subjectivity. This implies that the ethnographer's experience and interpretations are universal, objective, and self-evident. When the time comes to document and report one's research findings, an objective, impersonal "voice from nowhere," is to be avoided. Attending to the politics of positionality, then, is less of a discrete "moment" or "task," and more of a posture of openness to—and responsibility for—one's limitations throughout the research process.

While an exhaustive treatment of the relationship between phenomenology and politics is beyond the scope of this brief chapter, it is important to note Madison's commitment to the political dimension of phenomenology. She distinguishes her phenomenological methodology from the classical, Husserlian study of a transcendent consciousness and subjectivity that is "bracketed" from the surrounding, natural world (Husserl 1999). She opts instead for Heidegger's hermeneutic phenomenology, which accepts that our first-hand experiences are indelibly marked by society, culture, and history (Heidegger 1962, 1999). In her formulation, the critical ethnographer presupposes macro-level systemic inequalities and political injustices to be detectable at the phenomenological level of our participants' every day, subjective experiences. Madison (2005) further explains:

> [C]ritical ethnographers embrace phenomenology's orientation toward embodiment and perception, both in the telling and enactment of experience. We understand that human

[3] Madison's emphasis on positionality is preferred to Pink's distinction between the subjective and intersubjective dimensions of the sensory ethnographer's subjectivity (see Pink 2015b, pp. 58–65).

> perception, on the one hand, reveals idiosyncratic meanings, contingent truths, and felt-sensing perspectives that are born from materiality, power, and the complexity of presence, and, on the other hand, uncovers what it feels like to experience all these elements up close and personal (p. 58).

In sum, Madison's framework prepares the ethnographer for a reflexive, vulnerable process of discovery and understanding and encourages close investigations of participants' first-hand experiences as they negotiate the consequences of social and political inequality.

2.6 A Critical Sensory Ethnographic Approach to the Study of ARt

Taken together, Pink's sensory ethnography and Madison's critical ethnography provide us with ethnographic principles to be further adapted to facilitate the study of augmented reality art. In particular, Pink argues for the significance of extralinguistic ethnographic data and calls for creative ethnographic studies of the relationship between the sensory and semiotic dimensions of embodied knowledge and practice. Madison complements Pink's perspective with an incisive call to critically evaluate the socially and politically salient domains of ethnographic positionality, as well as our participants' phenomenological perspectives. Extending Pink and Madison, I apply a critical sensory ethnographic perspective to the study of socially, politically, and globally engaged ARt. Below, I outline this approach while drawing on a case study from my ethnographic work with contemporary ARtists.

Pink notes that sensory ethnographic interviews and participant observation need not be conducted in a shared, physical space between the researcher and the participant. In response to Pink's (2015b) call for additional digital sensory ethnographic scholarship, I have adapted her guidelines to my remote, digital ethnographic practice in the midst of the COVID-19 pandemic. For the study of ARt, in particular, a sufficient amount of data can be generated via remote video calling and screen-sharing technology between the researcher and participant, coupled with the researcher's ability to download and experience a participant's work of ARt on their own mobile device. If the ARt is located spatially, of course, it is preferable that the researcher experience the ARt in its intended context. If the researcher is unable to travel to the space where the ARt is geolocated, or if the location is not safe to visit, a sufficient alternative is to invite the participant to record a video of the ARt experience in practice, and to share the video with the researcher while guiding them through the intended experience, step-by-step. This show-and-tell style of digital ethnographic interviewing combines traditional ethnographic interviewing techniques with the "think aloud protocol" routinely utilized in remote and in-person user research contexts (Boren and Ramey 2000).

For our purposes, a laptop alone is not a sufficient critical sensory ethnographic interview tool. While conducting a remote ethnographic interview, it is recommended

that the researcher be connected to a wired Internet connection while utilizing at least two computer monitors, and a supplemental web camera, speakers (or headphones), and microphone equipment. This helps ensure that the participant will be able to clearly see, hear, and sense the researcher's presence, including the researcher's verbal and non-verbal cues to encourage the participant as they share. The equipment also enables the researcher to experience the one-on-one interview with one dedicated monitor, while experiencing any screen-shared, multimedia content on the second screen. The external speakers (or headphones) are especially important for the researcher to adequately hear not only the participants' voice (including their unspoken cues, hesitation, laughter, and so on), but also allow the researcher to optimally perceive the sounds that might accompany a work of ARt. A mobile device (tablet, phone) is also important to have on-hand, in the event that the ARtist shares a work of ARt that the researcher can experience directly.

During a digital ethnographic interview that includes screen-sharing, several phenomenological details are pertinent. Importantly, it is recommended that screen-sharing be delayed until the researcher and participant have established some foundational rapport in the initial one-on-one portion of the discussion. Sharing one's screen too soon introduces a transactional, distant feeling into the remote encounter. After anchoring the encounter with this initial sense of co-presence, the researcher should invite the participant to share their screen and demonstrate their ARtworks. While screen-sharing, the ethnographer ought to take the time to ensure that, at minimum, thumbnails of the participant and researchers' faces are visible for both individuals. The researcher might need to assist the participant to configure these settings, but it is imperative to maintain a sense of co-presence as content is being shared.

The initial moments of the critical sensory ethnographic interview are extremely important. In addition to obtaining the participant's consent, answering questions they have about the study, establishing one another's pronouns, and ensuring the technical equipment is functioning for both individuals, these initial moments are an opportunity for the researcher to mindfully ground the emotional and sensory dimensions of the interview with their affective presence. At this time, the ethnographer has the responsibility to take note of how their presentation and positionality relate to their participant's subjectivity, and to anticipate the consequences. This extends to tacit and overt details such as the two individuals' communication styles (i.e., hurried, calm), their countenances (i.e., shy, confident), their physical appearances (i.e., formal, casual), and the more explicit sociological differences in racial identity, gender presentation, age, class, ability, native language, and cultural background. The researcher is responsible for assessing these dynamics throughout the interview, and being mindful that their positionality might introduce an imbalance of power at any point. A straightforward way the researcher can ensure that these disparate variables come into alignment is to avoid the urge to fill silence, nervously speak and dominate the affective space throughout the interview. A helpful objective is to encourage the participant to serve as the most active interlocutor, while the researcher remains engaged, inviting, and warm without resorting to condescension. Following the interview, it is recommended that the researcher include their assessment of the above dynamics in their field notes, in order to further contextualize their findings.

Fig. 2.1 Artist Steven Christian installed his "George Floyd AR Memorial" throughout Portland during the city's 100 days of Black Lives Matter protests in 2020

2.6.1 Case Study: "George Floyd AR Memorial" by Steven Christian

We turn now to a case study from my ethnographic research with contemporary ARtists who use AR as a form of protest and activism. Below, I apply a critical sensory ethnographic approach to American artist Steven Christian's ARt practice, and his work entitled "George Floyd AR Memorial" (Fig. 2.1). While an extended account of his ARt practice is beyond the scope of this brief chapter, I conclude with an abbreviated summary of my findings.[4]

Several months before our interview, I became familiar with the content Steven posted to his YouTube channel and Twitter in response to the Black Lives Matter (BLM) protests following George Floyd's murder on May 25, 2020, by former Minneapolis police officer Derek Chauvin. Steven was based in Portland, Oregon, at the time, which was the site of over 100 days of BLM protests in the wake of Floyd's death. As a Black American navigating the swell of political activity surrounding racial injustice during this moment, Steven responded to Floyd's murder and the ongoing protests with AR as his medium of choice. In August of 2020, Steven posted videos and images of his AR installation that featured one central asset—a digital, bronze, 3D bust of George Floyd modeled by sculptor Rodman Edwards.[5]

[4] Notably, my positionality as a white ethnographer with a background in Africana studies and cultural sociology introduced conditions and limitations into the ethnographic process that required ongoing reflexivity. Accordingly, I collaborated with Steven Christian as I prepared this chapter. I wish to thank him for providing feedback prior to this chapter's publication.

[5] The model is available on Sketchfab at the following link: https://sketchfab.com/3d-models/george-floyd-memorial-bust-0c4f918e8e16463e8d5de92bc49a9f23.

Fig. 2.2 Steven Christian's "George Floyd AR Memorial" installed at a Portland park by the artist

The ARtwork consists of a fiducial marker that enables the user to trigger the bust of Floyd by pointing the camera of their mobile device toward a flat surface. Once triggered, the bust of Floyd appears where the user wishes to place it. The user can then open the ARtwork's settings to scale the bust height up to 30 feet and to rotate it by 360 degrees.

After finalizing his work, Steven ventured to landmarks throughout Portland to install his ARt. He recorded videos and screen shots of the ARtwork on his mobile phone as he installed Floyd's commemorative bust at significant sites, including the city capitol building (Fig. 2.2).

Steven then posted the content documenting his ARt experience to his social media accounts, later accompanied by a step-by-step tutorial that other creators could use to build the installation themselves in Unity (Fig. 2.3).[6]

To further increase access to his ARtwork, he added it to his mobile AR app that features several of his ARt installations (Fig. 2.4).[7]

Steven and I met for the first time in January 2021 in the middle of the COVID-19 pandemic, about two weeks after protestors stormed the US Capitol building. Due to social distancing restrictions, Steven and I conducted our ethnographic interviews remotely utilizing video calling and screen-sharing technology throughout 2021. During the initial moments of my interview with Steven, he explained to me that he identifies as a "teaching artist," a multimedia content creator, and an "experience builder." He is a self-taught animator, specializing in comics and augmented reality. Growing up in the Bay Area, Steven explained that he had always been intrigued by the culture of Silicon Valley, but quickly realized that Black creators like himself were forced to confront significant barriers to entry. In response to this lack of

[6] Steven Christian's post regarding the memorial is available here: https://stuckonaneyelnd.medium.com/i-made-an-augmented-reality-app-that-triggered-racists-a8f377dc50b0.

[7] Steven Christian's mobile app is available here: https://iltopiastudios.com/eyelndfeevrapp/.

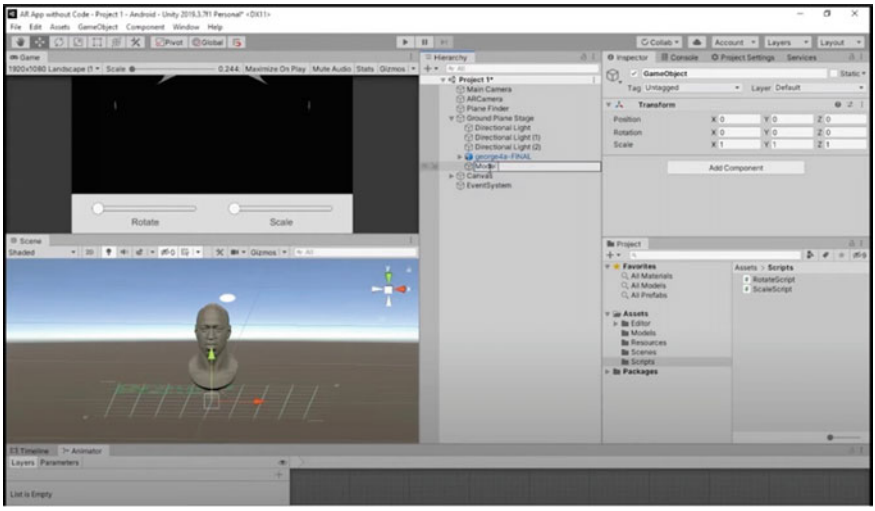

Fig. 2.3 Screen capture from a video tutorial artist Steven Christian posted to his social media channels to equip other creators to learn from his "George Floyd AR Memorial" design process (Image credit Steven Christian, used with permission)

representation in tech, Steven became a prolific ARtist, generating hundreds of videos of himself talking about and creating ARt, as well as content that gives form to what he describes as the Black experience. He elaborates, "So essentially, all the people that I looked up on YouTube, they're all white. And so I just want to embody what that inclusion looks like … I wanted to show, like *physically* show, what Blackness and AR can look like."[8]

Throughout our interview, I learned that Steven is driven by a strong commitment to the performative implications of his practice as a Black ARtist and teacher. To him, generating online content that routinely represents his physical presence, on-camera, as a Black creator through his myriad social media channels is central. As a *teaching* artist, Steven further explained that his practice is constituted by a pedagogical dimension intended to equip aspiring Black creators to explore the medium of AR, thereby lowering the barriers that once held him back. His channels are replete with courses and tutorials that are thorough enough for the AR-savvy, yet approachable enough for the novice.

Our interview consisted of a combination of one-on-one discussion with and without shared screens. Steven walked me through a variety of ARt projects—some finished, some unfinished—to further illustrate the kind of experiences he seeks to curate for the end user. I recorded our interactions to analyze later, which enabled me to become immersed in the installations as he shared them, rather than becoming

[8] Steven Christian's quotes throughout this chapter were obtained during an ethnographic interview with the artist in January 2021.

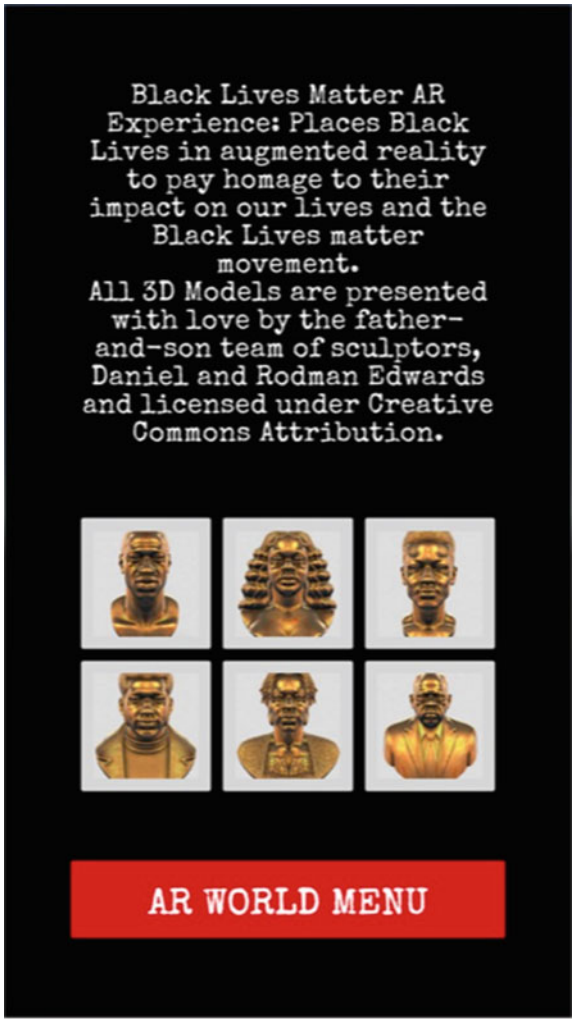

Fig. 2.4 Homepage of the mobile AR app Steven Christian designed to support the Black Lives Matter movement

distracted with notetaking. Following our interview, I also downloaded his app, and experienced several of his ARtworks on my own.

As I probed to learn more about Steven's "George Floyd AR Memorial," he recounted his decision to support the Black Lives Matter movement and pay homage to Floyd through the medium of AR. For health and safety reasons in the midst of the pandemic, Steven did not physically participate in Portland's 100 days of BLM protests. As I listened to Steven explain his decision not to participate in the protests in-person, I sensed that he regarded AR to be more than simply a digital alternative to protesting "in real life" (IRL). In reference to the overarching questions that guide the critical sensory ethnographic study of ARt initially posed in this chapter's introduction, I employed the framework to pursue a deeper understanding of Steven's

ARtistic practice by considering the sensory, somatic, semiotic, cultural, and political categories at play in his ARt. We explore these dimensions of his practice below.

Steven recalled that as our physical lives were quarantined for the better part of 2020, he sensed a collective shift taking place—a dramatic experiential pivot toward the digital realm. Quarantined and socially distanced from others in the initial months of 2020, society's (already considerable) dependence on the Internet rapidly accelerated out of necessity. And then, after a few months of acclimating to this increasingly digitized mode of everyday life, the murder of George Floyd was captured on video and broadly circulated throughout this shared, online context. Steven recounted how it felt to experience the visceral, digitally mediated depiction of Floyd's murder with the rest of the world, online. He explains, "[That] wasn't disconnected from the internet. It was very much a part of the internet … it was an experience that we *all* had watching a video, [and then] seeing people riot or … protest … those things were part of an experience. So, I wanted to use AR to really build on that experience."

From his perspective, then, the embodied knowledge he acquired in the context of the pandemic was constituted by a pervasive feeling of physical solitude combined with a profound, almost paradoxical sense of co-presence with an online, global collective. With the same digitally mediated experiential grammar, so to speak, Steven created his ARt memorial for Floyd as the subsequent enactment and extension of this embodied sensory knowledge. As we further consider the conditions of his ARt installation and its subsequent circulation, the sensory, somatic, semiotic, cultural, and political dimensions of his practice come into view.

At the phenomenological level, Steven's decision to install his memorial to George Floyd during the calm, daylight hours of Portland's 100 days of protests is salient. Steven explained that he initially designed the ARt installation to experience it for himself, to walk through an augmented version of Portland's built environment on his own terms—peacefully, safely, before the sun set and the streets filled with tear gas and rubber bullets. As a personal, phenomenological encounter, his ARt enabled him to move through a reimagined reality where he was free to pay homage to Floyd and demonstrate his support for the Black Lives Matter movement by occupying physical space safely and confidently (Fig. 2.5).

The next moment of his practice consisted of occupying virtual space in the same unapologetic manner, as he shared his augmented reinterpretation of Portland throughout his social media channels. In this way, recording the augmented encounter on his phone and posting it online enabled him to express and defend what he characterizes as an ineffable dimension of the Black experience. From a semiotic perspective, Steven understood this process to be subversive not only because his ARt depicted George Floyd's likeness (a familiar signifier of the BLM movement), but because the installation is documented from Steven's first-hand perspective as he reimagined Black reality on his terms. He considered the public circulation of his personal, phenomenological encounter to be an important moment in his creative practice. He was also aware that sharing his first-hand experience of an augmented Portland would elicit criticism. He elaborates, "[L]ike a lot of things within the Black experience, it's very hard to like find data to prove it. And so one of the things I did with the George Floyd [memorial] was, I, you know, made the experience, put the

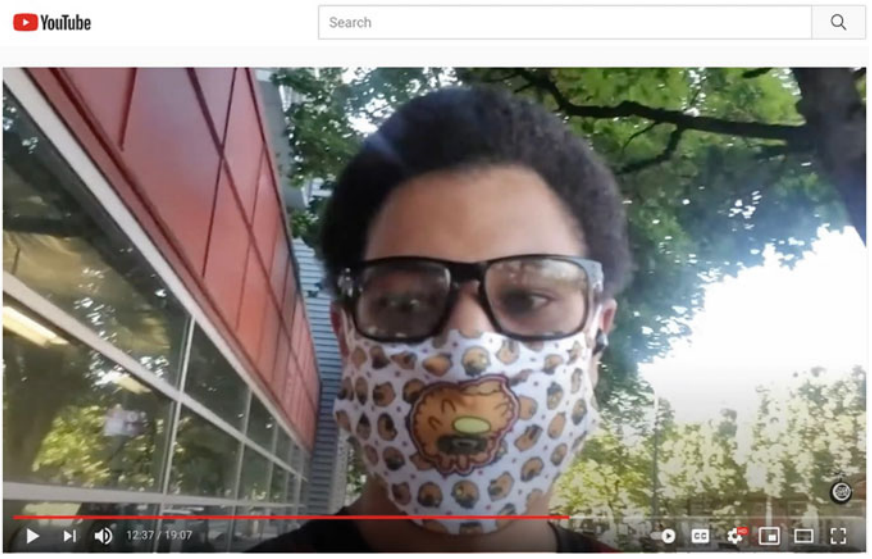

Fig. 2.5 Screen capture of Steven Christian's YouTube channel featuring his first-hand experience installing his "George Floyd AR Memorial" throughout Portland in 2020. Christian wears a mask during the COVID-19 pandemic

installation together, and then I went out … took the pictures, and did the video and posted it online." While the work was met with positive online reception, he also experienced racist criticism—"[T]hen, you'll get the racists that will come through and like … they'll try to belittle your efforts and what you're trying to do, how you're trying to express yourself and so on."

I then sought further clarification about his ARt's relationship to the political, as he articulated his understanding of the relationship between Blackness and activism. If we recall Madison's (2005) emphasis on the relationship between phenomenology and the political, Steven's comments about his practice below shed light on the political ontology of Black subjectivity:

> I think part of the Black experience is understanding that … the lines are blurred when it comes to sort of just like self-preservation and activism. Cuz it's like … are Black people being activists when they're just trying to have the opportunity to vote? Or when we're trying to have the opportunity to live in a place that other people have the opportunity to? Is that just being an activist, or is that just being a citizen? You know? I think the lines are blurred when it comes to that. So for me, as a Black creator in AR, I am just trying to create things that improve on the experiences that Black people have … I guess I am [an activist] by default, but I am just sort of a Black creator.

This assessment of the political implications of his ARtwork offers empirical nuance to the literature related to digital activism (Schradie 2019) and political art (Bishop 2012). Steven's understanding of the inherently political nature of racialized subjectivity poses an interesting challenge to analytical distinctions that separate IRL/digital political participation and political/apolitical art. The manner with which

Steven's ARt collapses such distinctions via technological experimentation invokes a strong, Afrofuturist sensibility that undergirds his practice.

When I asked Steven if he felt that his creative practice could be similarly achieved with the medium of virtual reality (VR), he explained that his creative and political motivations were more aligned with the medium of AR:

> Yeah, so I've never really been drawn to VR. For me, AR has been a very enlightening medium to operate in because it builds on the experiences that we all appreciate … I'm not attracted to VR because it moves you away from the world, as opposed to enhancing it. So, for me, I'm more interested in increasing accessibility, of, and improving on experiences that we sort of are forced to use and operate with already … So, the opportunity to make real, lasting, impactful improvements on [extant] experiences is one of the most attractive things for me [about AR].

As Steven surveyed the landscape of Portland in the summer of 2020 where physical infrastructure and memorials were regularly being deconstructed by ongoing protest activity, the staying power of ARt also became increasingly appealing to him:

> So, the thing that I really appreciate about AR and … activism … is that it's nondestructive, and it's asynchronous … or it's decentralized in many ways. So the beauty of it, much like the Black Lives Matter movement where there's no real hub, you can't destroy it. The beauty of AR is that, like all the people that didn't like the photos of the 30-foot bust of George Floyd … in front of the capitol or in front of all these like landmark places … If this was an actual [physical] installation, you have to get a permit. People would protest and people would, you know … destroy it … like they're doing to all the landmarks already. [With AR], you can't come up with a law that will redline me … You can't come up with a fine to say 'Oh, you didn't have a permit for this.' You can't come up with any of these frivolous things that have led to the oppression of Black expression and Blackness … And so that was the most liberating thing about it is that I didn't have to put myself at the mercy of others … I was playing by a different set of rules.

As a teaching ARtist, the concluding moment in Steven's practice is the pedagogical dimension that informs his work. If we recall Steven's prior comments regarding his performative inclination to inspire Black creators by embodying "what Blackness and AR can look like," I suggest that this case study also demonstrates how Steven's practice evokes a sense of what Blackness and AR can *feel like*. By providing a design tutorial to accompany his "George Floyd AR Memorial," Steven mobilizes the semiotic and sensory knowledge that constitutes his ARtistic practice to equip Black creators to build immersive experiences that look and feel germane to them. This dimension of his ARt practice has critical potential in a white-dominated creative space where the technology and defining conditions of immersive meaning- and sense-making practices are constructed and maintained largely without the epistemological contributions of creators of color. Thus, Steven's ARtistic practice invites us to critically abstract from ostensibly apolitical accounts of "the immersive"—immersive for whom? On whose terms? Embodying whose humanity, knowledge, or affective presence?

2.7 Conclusion

The inaugural wave of ARt illustrates the medium's ability to combine the sensory and semiotic conditions of meaning-making to produce compelling, augmented experiential glimpses of more socially and politically just realities. Thus, this chapter addresses a methodological gap in the digital ethnographer's toolkit by providing a medium-specific approach to the study of ARt, termed "critical sensory ethnography." The application of this framework to the case study of artist Steven Christian's "George Floyd AR Memorial" demonstrates that embodied, immersive experience is a socially and politically salient phenomenon. It is recommended that industry and academic ethnographers continue to investigate how diverse populations creatively leverage the social and political potential of AR beyond its mainstream uses.

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Chapter 3
Why We Might Augment Reality: Art's Role in the Development of Cognition

Judson Wright

3.1 Introduction

In discussing Augmented Reality (AR), it is common to begin with art: the premise that art exists, that computers are one means to create it, and that AR is one motivation to create computer art. As art is primarily assumed the domain of aesthetics, this further leads one to consider computer art a means of expressing aesthetics. While hardly inaccurate, this path is a misleading for us here. Behavioral Art (BA), and its relationship to AR, is profoundly different. To consider BA, we are required to abandon the notion of aesthetics, at least temporarily. We begin by thinking instead about a function involving linguistics and (cognitive) development in a somewhat novel way.

For instance, when discussing cars, it is hardly objectionable to tacitly assume that the car is used as mode of transportation. We do not ordinarily assume the discussion will be about the car as a (stationary) couch. When discussing seating in general, car seats are indeed likely considered. Likewise, the computer's unique and unprecedented ability to execute code is implicit in our discussion of computers. Just as one could freely purchase a car, only to be used exclusively as a couch, a computer certainly can be used for media. Moreover, the influence of psychology on human experience is far more central to BA (Hoffman 1998).

Furthermore, absolutely all digital creations, presentations, and/or editing have long been accomplishable using analog tools. There would be no reason to differentiate media production created by certain tools and not identical works created by others (Reeves and Nass 1996, pp. 193–210). On the other hand, when we discuss the process by which we conceive of some problem in terms of a logical syllogism or *algorithm*, notating that logic into one or more formalized codes, to be rendered mechanically, only one such tool excels far above any previous invention. Regarding

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programming, there is now little impetus for us to mention couches or media. They are unrelated to our discussion here regarding perception (beyond the visual) and this programming tool.

3.2 Development

We humans are unique from other species, in that we undergo an unusually long period of development. Since this is 'costly' in terms of survival fitness, it is unlikely to be accidental. It also indicates that the minds we enjoy are qualitatively different than minds assembled by biology for briefer purposes. This is not to imply that turtles are 'smarter' than dolphins, but that a longer juvenile period results in different needs. Shorter-lived organisms and machines function sufficiently, without need to fine-tune behaviors much, if at all, to an unpredictable environment. The environment of many organisms can be expected (by evolution) to remain fairly static during the organism's lifespan. Not long ago, it was believed that when learning does seem to take place in other organisms, it must be due to a reward system. Though Behaviorism was generally abandoned decades ago, the model of *instrumental conditioning* (IC) remains deep-rooted in popular conceptions about learning. A ramification of IC is the view of communication proposed by Claude Shannon (Ash 1965; Shannon and Weaver 1949). Even that children are tested and receive grades is a form of reward/punishment aimed at training for a desired response. Though many children do benefit from this traditional methodology, it is hardly universally helpful and can even be debilitating for many students (Dewey 1910; Kohn 2008; Phillips and Soltis 2009; Tough 2012).

3.2.1 Machine Learning

No doubt, the inner workings of the pre-processor in the computer may strike many readers as unnecessarily esoteric. Unfortunately, the counterintuitive details addressed in this preliminary section illustrate a fundamental premise in BA and give AR its role therein. Beyond casual conversation and speculation, the common-sense model of *machine learning* applies exclusively between machines and not to organic brains (further discussed in Wright 2012a, 2013a). Shannon's heavily influential notion of communication is prohibitively restricted from development, and thus learning, in any biological sense. We humans are in no position to insist learning is entirely synonymous with mechanistic causality (Fischer 2011; de Waal 2016). In Shannon's defense, much more is now known about the learning process than was available to him at the time. Though we might refer to successful strategies of stimulus storage, transferal, retrieval, and broadcast, these are only preliminary

tasks, insufficient to account for 'borrowed intelligence' (Wright 2013b). Particularly, insightful has been the more recent distinction in linguistics between *signaling* and *communication.*

A qualitative difference lies between signaling, akin to graffiti, viewable by any, for as long as the graffiti remains legible, where a unitary message is sent and received and is not generalizable to other contexts, and communication, where multitudes of messages effect the further stream of messages, as per the needs of all conversationalists involved, where the successfully communicated message influences subsequent messages. Both synchrony and self-synchrony are extremely relevant in that signalers, such as nonhuman animals and machines, do not render messages by other physical means than the medium specific to the message (Bavelas et al. 2002; Knapp and Hall 2006, pp. 43–54). For instance, humans can speak the same text verbatim, employing a wide range of behaviors to ultimately convey very different things, or use a wide range of syntactical means to convey essentially the same content. In such cases, which are only conclusively evident in humans, and we have very little understanding of how this might be automated, the message is one of several means for directing (not causing) further interaction. Once we have better understood how these problems are solved in organic minds, via some form of nonverbal communication, we might then revisit how the computer could be implemented, not directly (again, as if the computer were a graffiti generator), but as a prosthetic tool (Licklider 1960; Wiener 1950). Though it is popular to say that computers and brains are nothing alike, it is also popular to apply the same model of processing to the brain as to machines, with only a vague sense of how that processing might take place. For this reason, while we do not intend to outright debunk the notion that intelligence can be synthesized (Horzyk and Tadeusiewicz 2005), we do need to initially discuss a nuance of processing, which bears on a particular role of communication, consciousness, and ultimately AR.

Computers are mechanical tools, which inventors have adjusted to correspond to our concept of mathematics. Programmers then apply this numerical correspondence to concoct complexes of syllogisms, which can be further reformulated in very unmathematical-looking graphics. Insofar as one might metaphorically envision circuits and transistors as hierarchical conditional tree diagrams (as in Lakoff and Johnson 1980), a similar assemblage of metaphors in the imagination allow one to make sense of Boolean logic, as applied to digital processing. The assumption is that this empirical scheme applies to any cognitive function may be more about personal perspectives than about a priori truths (Baron-Cohen 2009; Boyd 2004). The case is argued passionately both by those who feel this is obviously true (Shanahan 1997; von Neumann and Morgenstern 1944; Glimcher 2009) and those who feel this is ridiculously impossible, particularly considering human interaction (Ackernan and Bargh 2010; Edelman 1992; Koch and Tononi 2011). 'Every Boolean function no matter how complex, can be expressed using three Boolean operators only: And, Or, and Not' (Nissan and Schocken 2005, p. 9). The question remains then whether every task can be expressed as a *conditional statement*, using one of several variants on the theme 'if *x*, then *y*.'

It is further restrictive that, due to the evolutionary construction of the brain and DNA, a 'lesson plan' must simultaneously be somewhat useful in our current environment, but applicable to some ancestral species-specific environment (Bjorklund and Pellegrini 2001). Olaf Sporns, in his overview of neural networking, states that 'Nervous Systems do not converge onto a final stable pattern of optimal functionality, rather, their connectivity continues to be in flux throughout life' (Sporns 2011, p. 252). Thus, no matter how similar a neural network in an organic brain and one in software process computational tasks, there is still an additional, perhaps far greater task, which is not remotely addressed by mechanical means, in ongoing recontextualization of data, from generalizing to other domains, to inferring detailed implications (Koch and Tononi 2011). Because this ability is not instantly formed (by phylogeny), but develops gradually via subjective learning (in ontogeny), it is not a candidate for the static instructions of software. Insofar as physical laws, the inner workings of the machine are chained merely like dominoes (Fig. 3.1). Accumulating more and more simple physical reactions can never possibly yield an increase of intelligence to the system. Strict adherence to mathematics is both a strength and a

Fig. 3.1 Even at the detailed level of the internal workings of the computer processor, essentially a transistor of switches, physical laws merely operate in non-complex chain reactions. Mechanical intelligence can only be accomplished by the computer, as much as intelligence might by configuring more dominoes

weakness. 0 + 1, if calculated by the rules, no matter how many times, will never get to 2. Manipulations of binary digits simply do not accumulate anything.

3.2.2 A Grouping Impulse

Humans also have a tendency to speak of messages metaphorically (in the non-technical sense) as packages that are designed by some external force, and travel to us, into our minds. Beyond the convenience it may provide in colloquial conversation, it is highly speculative and assumes dualism, where the mind and brain are linked by some mystical force, not subject to physical laws. Though a few researchers have questioned this Platonist view in the last 100 years or so, it would appear to remain the devout doctrine of uneducated laymen and the most educated scientists, in most every field. Firstly, we should point out that these messages need not come from intelligent sources. There need be no actual sender. Rather, a message received seems to indicate intelligence only in whichever source the recipient assumes authored the message. Of note here is *attribution theory*, in particular the famous experiment by Fritz Heider and Mary-Ann Simmel (1944), where subjects were shown an animation of simple geometric shapes. Afterward, the subjects nearly unanimously described the events on screen as if the shapes had personalities and volition. Likely each individual did realize that these obviously drawn abstract shapes could not possibly behave in social ways. Regardless, it is notable that the subjects suspended belief to the extent that it becomes ambiguous exactly to what extent these subjects are certain their descriptions reflect their interpretations. But note, we would not insist these subjects were wrong, mistaken, or lying in their reports, merely that humans have an idiosyncratic perceptual/conceptual system that is usually effective (in the Pleistocene) but far from ideal in all modern situations (Wiener et al. 2011), namely AR.

Computers manage the assembly of computers. But *recursion* is hardly sufficient to qualify as intelligence. What is intelligent is that the execution is not an end, but a means concocted, with no explicit connection provided between the goal and the strategy. In this scenario, there is no reason to believe the computers coming off the assembly line on day two are any more or less intelligent. Than those made on day one. The computer/manager did not decide more computers would be a benefit, the machine is only routinely obeying code (written by someone who believes more computers would be a benefit). Only the human, who designed this system as a solution to a personal need shows actual intelligence. The managing machine cannot be said to have needs. But the attribution of personality traits to the inanimate computer/manager often fools, not only those in search of evidence of *artificial intelligence*, but many of us who merely engage in tool-use during play.

However, before we decide that this *impulsive projection of communicative meaning* (Wright 2012a) is an inaccurate—and thus 'wrong'—view, consider alien abduction stories. In many cases, these theories hinge on false-positives. The truth of the matter is not actually provable, nor is ultimately relevant. What often is the case,

these soon-to-be-abductees (StBAs) suffer from some experience that is inexplicable within the world they have constructed (Clancy 2005). This event need not be traumatic, but may simply be due to a confounding life of accumulated mundane causes. However, in the larger scheme, the StBA may feel that life has been unusually difficult, disappointing, and/or depressing. Though alien abduction would hardly be their first explanation to justify some disconcerting event, eventually all other reasons fail to satisfy. Alien abduction further has the benefit that the StBA, who previously felt undistinguished by luck, can now feel chosen. A peculiar result, that Susan Clancy found, was that once the dubious alien abduction story was accepted by the abductee, that person's outlook often changed for the better. The truth is irrelevant, and inaccessible, but this augmentation of reality serves a higher psychological purpose in creating a 'patch' for a damaged worldview.

A peculiar and unique tendency in humans, we discuss extensively elsewhere, is to impulsively elect to divide fluid stimuli, such was a rainbow into 2–8 colors, or sonic frequency spectrum into musical notes (Wright 2010, 2013b). Further, this division depends on the acquired culture. These groupings are in no way real, but imaginary. Yet they remain salient byproducts of a typical human perception process (and prove informative in atypical instances, as with lesion studies). Particularly when we consider that the computer, which appears to calculate ideally, we are forced to consider what purpose might this idiosyncratic grouping effect serve?

"One notable feature of the major scale is that it contains several intervals whose frequency ratios approximate small, whole-number ratios. For example, … 3/2, 4/3 and 5/4 … This is no coincidence. Western music theory has long valued intervals with simple, small-number frequency ratios, and these ratios play an important role in Western musical structure. The Western fascination with such ratios in music dates back to Pythagoras, who noted that when strings with these ratio lengths were plucked simultaneously, the resulting sound was harmonious. Pythagoras had no real explanation for this, other than to appeal to the mystical power of numbers in governing the order of the universe" (Patel 2008, p. 15; *see also* Levitin 2006, p. 37).

As any salesman will tell you, insisting that customers 'buy it!' will not be nearly as effective as when customers come up with the idea to do so on their own. What is interesting is the very personalized ways in which each individual 'comes up with it'. Howard Gardner's *Theory of Multiple Intelligences* (Gardner 1983) is a good way to think about this. Gardner shows how children may learn better by seeing a colorful example or may learn better by singing a song in a group, but will tend to choose their own *learning style* in play (Humphrey and Gutwill 2005; Piaget 1962; Sfard 2008: 76–80). Unfortunately, these preferences are inevitably restricted somewhat by which 'teaching styles' are readily available, given their teachers' methodology and within the child's culture (Castelfranchi 2011). However, parents might breathe a sigh of relief to know that this is only 'somewhat' the case. In general, as many parents have surely experienced, children can be very clever in finding ways to explore these learning styles. Nonetheless, even if we concede that the practice of art *appears* to have grown out of markings of environs by artists. In the parlance of Chomsky (1957: 15), Hauser (1998), Chomsky (2000) art serves a far more crucial function for cognition (as distinguished from machines) as *deep structure* and less as

surface grammar/effect/decor. It is a biological strategy that has evolved for cognitive development and maintenance. Ultimately, an instance of this strategy is AR.

3.3 Augmentation

Though it is popular to say that learning occurs socially, what we intend to investigate is the means by which cultural groupings of behaviors are distinguished from non-cultural events and behaviors. This subtle exchange requires not just dictating of factual data, but confirmations and clarifications to coordinate participants (Millikan 1995; Wright 2012a). In discussing this essential aspect of learning, Lev Vygotsky's influential theory (1986) theorizes how minds make a reasonable assumption about the subtle relationship between social behavior and culture, but it is an assumption, nonetheless. Firstly, it assumes that culture actually exists externally to the perceiver (as in Platonism), rather than as an internal conceptual gestalt. Secondly, it does not take into account human's predisposition toward grouping as essential to perception, interpretation, and subsequent conceptualization. This is where AR comes in. What physical, concrete cues exist that might reveal that social behavior is manifested in intelligently organized clusters, which we might call culture? Before answering, consider that the man-made machine (i.e., a computer) can only detect and calculate exclusively employing concrete physical reactions. Conditionals ("Is it a square or not a square?") might be explicitly coded or implicitly sought (as in AI), but never invented ("What should I notice about this scene?") In other words, AR is a technique by which a computer views reality, devoid of the subjective associations which humans impulsively experience the world. At this point, we find that art serves three crucial roles. An author (1) embodies a cultural concern. An audience member can (2) show interest (e.g., visit the art gallery) or (3) further create embodied concerns that are non-non-sequiturs. These culturally specific concerns are profoundly amorphous, and so we will begin with the simplest format, storytelling.

But we must not be too excited about the need to involve technology. For example, storytelling as a linguistic exercise is useful for development of older children, who are comfortable with verbalizing thoughts. However, by 'story telling' we refer to something beyond merely descriptions of imagined events. It is the ability to organization of conceptual objects and understood dynamics. Early training on the violin or listening to Mozart (Campbell 1997) was believed to enhance general intelligence, the impetus for this resting on dubious understanding of the brain. Rather, for younger children, this can be frustrating, as the necessary neuroanatomy has yet to be fully developed. There is even some informed speculation that pressure to conform to premature learning has long-term harmful effects (Several criticisms are discussed in Bjorklund and Pellegrini 2001, p. 248). Though intuitively one might believe early academic exposure would be stimulating, the scant evidence does not indicate this. More precisely, not all expression is equally 'good for you.' Written story telling may only be helpful to students who demonstrate a certain level of linguistic affinity. It likely only aggravates development to train earlier, whereas pre-language-fluent

children would likely be better off making torn paper collages, in order to describe an event (a lesson my wife, who teaches art, does with her pre-kindergarteners).

It appears highly likely that art, as it is commonly understood, including organizations of kinesthetic movements as dance and sounds as music, is practiced exclusively by humans. But even just to say this, immediately calls to question, how we distinguish art from non-art. Not too long ago, the label 'artwork' was primarily limited to paintings, sculptures, media that had long traditionally been identified as art. Only an occasional break of 'the fourth wall' would challenge these labels. Not long ago, serious reconsiderations were applied to architecture, craft, and so on (Benjamin 1929). John Cage, Jackson Pollock, Andy Warhol, and countless others had certainly revealed insufficiencies inherent in this labeling scheme (Cage 1961; Joseph 2003). Subsequently, it became popular to announce that, 'anything could be art!' However, this is equally disturbing. While originally, the label 'art' was invoked in ways the audience was not fully acknowledging, this alternative rendered the label fairly meaningless. Perhaps, a precise definition is elusive and subtle, but a *distinction* is made. Certainly, the thermostats on the wall at the Metropolitan Museum of Art do not receive the same attention as the paintings (Fig. 3.2).

"In the early nineteenth century, theater, such as the plays of William Shakespeare, attracted rich, middling, and poor alike, each seated in its own section and all participating in the performance. Audiences maintained control of the show by demanding encores of favorite parts, throwing vegetables, and even leaping onto the stage to interact with the actors, As middle- and upper-class Americans became more uncomfortable mixing with the lower classes, they began to demand separate theaters in which the audience remained passive and silent […] By the end of the nineteenth century, Shakespeare, along with opera, classical music and museum art exhibitions, became high art forms, and popular commercial culture emerged as entertainment opposed, and separate from, 'highbrow' culture" (Morrow 2006: 10).

However, like aesthetics, this particular mythology, that there even is such a social issue to defend or reject, threatens to dominate discourse about AR. It is

Fig. 3.2 Thermostat at the Metropolitan Museum of Art in New York. Photo by the author

hardly misguided to consider these very salient psychological byproducts of the phenomenon, but is entirely distracting from the cognitive issue here, the mechanism and raison d'être.

3.3.1 Creativity

The impulse to creatively express can be explained when we consider it to be precisely the same impulse as to creatively interpret. Just as optical phenomena (visual art) are subject to gestalt principals, so too are sonic phenomena (music) (Bregman 1999). But gestalt alone is not sufficient to impart meaning. It may often inform categorization of stimuli, but does not make the organizational scheme useful. Consciousness of a sensation is not simply the detection of sensation, supplemented later by the prefrontal cortex. Insofar as *frames* are cultural artifacts, human socialization (whether essential or not, lacking any practical alternatives) provides the initial step and direction of subsequent steps. Even if that interaction is merely the internal mental shift of attention (Ackernan and Bargh 2010; Dewey 1910, pp. 16–155; Schmeichal and Baumeister 2010, pp. 29–50; Searle 2001, pp. 33–60).

Like language, every culture it seems has a music theory that often differs in (learned) details, but between a few peculiarly limited parameters. This makes music a prime candidate to compare with language (Lerdahl and Jackendoff 1983; Patel 2008). Certainly, perception is culturally framed in composition and perception (Cohen 2006; Levitin 2006, pp. 57, 73–79, 114). Thus, some system must be shared between composer and listener for the music to make any sense (Jourdain 1997, pp. 74–78, 128–134; Becker 2004, pp. 108–116; Doidge 2007, p. 303). And like language, the grammar is rather culturally specific. A musical piece found quite moving to an American audience might sound like meaningless noise to members of a tribe in Bali (Kartomi 1980; Gold 2005; Wright 2012b) or the Middle East (Zonis 1980; Arbabi 2000), where exposure to Western music is minimal. A key element is interest (Dewey 1910, pp. 30–34; Allen 2004, p. 114), which is primarily interactively formulated by experience and culture. Noise must be potentially interesting before the brain determines that it is musical and thus worthy of a fuller assessment (Humphrey and Gutwill 2005). The role of some music theory is similar to Chomsky's *deep structure*, as revealed in his famous quasi-sentences (Chomsky 1957, p. 15), such as 'Colorless green dreams sleep furiously,' a verbal equivalent of a cat walking on piano keys.

AR is not a necessary result of sensory detection. There is a very gradual assimilation. Babies make nonsensical babbling *en route* to becoming children, who invent nonsensical stories before growing into eloquent adults. Manipulation of symbols, graphic, vocal, and otherwise, is an essential technique, in order to communicate, but communication is not at all exclusively the manipulation of symbol systems. Recall that in a biological view even noise serves a function, unlike most sciences where 'signal noise' is considered a bad thing, with the unrealistic the desire to eliminate it entirely. In recent neurological work, what we might be tempted to disregard as a

baseline of noise may also serve an intrinsic global networking effect (Sporns 2011, pp. 149–169, 174–175). Both Vygotsky (1978) and Piaget (1929, 1971) further point out that at about four, the child will recite a narrative, termed *egocentric speech,* as that child approaches a problem (Crystal 2005, p. 83).

"For example, a four-and-a-half-year-old girl was to get candy from a cupboard with a stool and a stick as possible tools. [The] description reads as follows: (Stands on a stool, quietly looking, feeling along shelf with stick.) 'On the stool.' Glances at experimenter. Puts stick in other hand.) 'Is that really the candy?' (Hesitates.) 'I can get it from that other stool, stand and get it.' (Gets second stool.) 'No, that doesn't get it. I could use the stick.' (Takes the stick and knocks at the candy.) 'It will move now.' (Knocks candy.) 'It moved, I couldn't get it with the stool, but the stick worked.' In such cases, it seems both natural and necessary for children to speak while they act; in our research, we have found that speech not only accompanies practical activity but also plays a specific role in carrying it out" (Vygotsky 1978, p. 25).

It would also be reasonable to say that the child is actually attempting to use her limited linguistic ability as an initial step in problem-solving. However, infants initially lacking conceptual concepts for their problems, will merely 'babble' (Eliot 1999, pp. 370–371). Importantly, Piaget also writes that children undergo a crucial transformation in distinguishing between internal and external worlds. Vygotsky's observations, quoted above, are all the more poignant when taking into account Piaget's *nominal realism.* This is the belief that words themselves are concrete substances, which are initially intrinsic 'appendages' of the objects named. The (imagined) objects that the words are located in the environment and, finally, conceptualized in the mind. At an early age, the word 'lamp' is usually thought to be located initially in the young speakers' mouth (Piaget 1929, pp. 71–72). A year or so later, the child may deduce that it is within the lamp (pp. 72–75). By about 9-years-old, the word is seen as located in the mind (pp. 78–80).

It has been theorized that the cave paintings of Lascaux were the remnants of a belief in magic, where these symbolic images may not have depicted (recently past) scenes, but instead thought to influence (upcoming future) hunting expeditions (Campbell and Moyers 1988, pp. 79–81; Solso 2003, pp. 52, 86–87). This would obviously be a primitive instance of AR, occurring long before the invention of computers. A hunt too can be seen as a problem-solving task, and thus an in doing so, the hunters might narrate plans, as modern children do, in a chosen symbolic system. That symbol system is the language which results in AR. Robert Jourdain (1997, p. 305) and others have further hypothesized that because the precise sites in those French caves where paintings were found had unusual acoustic properties, it was likely that the painters were accompanied by song. Theories regarding child development seem to reinforce the plausibility of these speculations. Singing (ritual) may be a form of problem-solving, as is painting or coordinating muscles in behavior (Curtis 1992).

This, coincidentally, is applicable to categorization of color perception, and exactly Joseph Campbell's point (1949), based on Jung (1935), regarding mythologies throughout the world. The crucial step in all of this is for us to recognize that

myth is not only culturally specific, taught and learned by culture, allowing the individual to membership that culture, but also allowing for neurological fine-tuning. This describes music as well. In fact, music and myth serve essentially the same function, save the trivial matter of modality. That we might devoutly believe sonic events to be profoundly distinct from conceptual organization is ultimately a matter of how well we are fooled by our own human propensity to apply categorizations.

3.3.2 Utilizing Reality

A piece which gathers text from RSS feeds and converts the ASCII characters found into musical pitches would certainly qualify as AR. However, in the larger scheme, this experiment fails to set up a relationship between the intelligently organized text and chaotic output of the musical composition software. In *Composomatic* (2008), information was gathered from multiple feeds and thus from multiple authors, with multiple unrelated contexts. As an implicit result, no singular organizing scheme came through. Imagine if single notes (and rests) were selected from various compositions and strung together at random. The resulting music would not reflect what each note was leading toward. It now seems obvious that individual notes are somewhat arbitrary out of context, but are essential building blocks in creating a context.

In *You've Got Bugs!* (2006), though the modalities involved are very different, the conversation is similar (Fig. 3.3). The screen depicts a closed-circuit video of the space in front of the screen, which includes the audience member. The scene is somewhat distorted and discolored as if the environment was rotted, but easily recognizable as a 'mirror.' One may wonder why this particular unappealing effect has been applied. An answer soon appears. Small virtual insects crawl onto the (live) scene. The audience member does not know at first, but the insects are crawling toward points of motion (and ignoring the static spaces). Thus, wherever the observer moves, the bugs seem to follow.

But most importantly for this piece, in the course of understanding what is happening on the screen, the audience member must experiment, behaving in ways that the gallery setting would not predict. An engaged gallery visitor will end

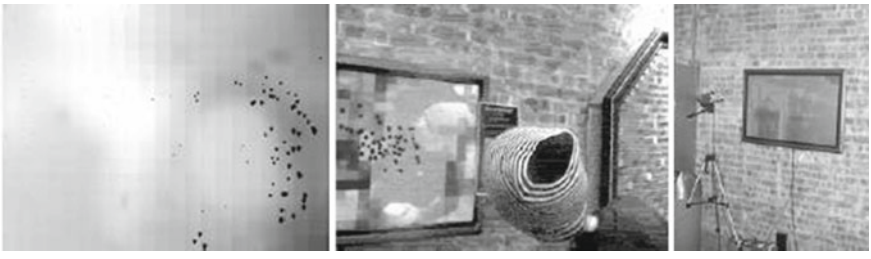

Fig. 3.3 *You've Got Bugs!* Screen shot and picture of installation with and without audience member

up ducking and swaying. This 'dance' is the viewer's spontaneous technique for understanding the environment, in this case facilitated by artwork, specifically AR.

3.4 Conclusions

Finally, we consider why evolution bothered to favor the ability for beat detection in humans alone. Begin by considering that whatever their authors' intention, mythologies are strategies used for culturally informed development. Any culture will do, none are intrinsically more or less ideal. This includes both traditional cultures, as well as ones invented in the course of a game. Nonetheless, we come to learn which patterns in the environment are significant to other members of that select culture. Ritual teaches us which artifacts to be revered, and in what ways reverence is expected to be shown. Symbiotically, the mythologist/artist, having assimilated the priorities of a given culture, arranges words and concepts into an explanation for these prioritized experiences. One might argue a piece such as John Cage's 3′44″ (silence, where the audience is intended to listen intently to the environs) highlights the experience. Random sounds may be heard by the audience member, but the mythologist-as-musician having arranged several of these sounds into a rhythm, provides the audience member with a means by which to discern meaning from chaos. In Cage's case, the composer pushes the responsibility of creating an organizing paradigm onto the listener (who may or may not very personally and internally accept such a responsibility). The audience member can now exhibit solidarity with the culture by dancing, tapping or otherwise demonstrating the successful application of cultural cues, as appropriate given these cultural rules. For instance, one might move vigorously at a club in response to music, but is expected to sit still when hearing 'Here Comes the Bride.' In both cases, these are taken as 'applications for social membership'.

Likewise, a painter may be drawn to the medium of paint, due to some personal *intelligence*, and is provided with tools to embody some otherwise un-articulateable problem. There is no possibility that an inanimate tool, such as a computer, actually 'curates' the problem-solving task at hand, creating the mythology within the artist's mind. In the same way, the abacus does not perform mathematics, but embodies a part of the cognitive process where limitations of the human mind are most apparent. Furthermore, in a minority of similar tool-using cases (namely computers), there is clearly the sensation experienced of animate behaviors and anthropomorphic personalities attributed to some events on the screen and not others. These cognitive-perceptual-ability-enhancing cases we might call 'art.' An audience member too may then be drawn by a personal *intelligence* to gaze longer at particular paintings. From the painting, that audience member culls the necessary clues to show solidarity. The essential trick, however, is that the painting is not literally an intelligent being with a message. At the cost of over-interpreting scenes on the computer (or even the printed page, as AR p[recedes the computer), by utilizing AR we can come to submit to cultures, in instances when only scant clues as to the requirements of

membership can be detected from literal, concrete sensations. AR (in whatever form) is an impulse-driven strategy for the ongoing task of updating the unusual pre-frontal cortex in humans.

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Chapter 4
Shifting Perceptions—Shifting Realities—Shifting Spheres

Margaret Dolinsky

4.1 Introduction

As an artist working in a practice of criticality and portraying psychic dilemmas, I am interested in perception, portraiture, how dilemmas express themselves, and how the thoughts and events fueling dilemmas reconstruct reality. Virtual objects offer a methodology for shifting perception and evoking a sense of other-worldliness that allows us to cognize our perceptions, their shifts, and affectations.

The construction of 3D computer graphical imagery in virtuality, and the placement of objects in space situates a navigational juncture for the visitor. The virtuality emulates a recuring memory that immerses the visitor, prompts subsequent action, and promotes a shift in consciousness. Augmented reality (AR) incorporates the act of placing computer-generated imagery in locative space for visitors to discover. AR is an experiential phenomenon that must be positioned and subsequently located or discovered. AR is fleeting as it is oscillating between being invisible and being made visible by situating a device and pointing the body into the artificial cognitive space.

The computing device, a data processor, a configuring machine, recognizes its location in the real world and retrieves an artificial entity to introduce in our presence. The device combines the physical movement of our body in synchronicity with the virtual body which energizes the moment: The corporeal and the machine are bound in a virtual entity being born. A visitor recognizes the AR entity in the viewing device and perceives it as an articulation between self and world. One must suspend their disbelief in order to integrate the virtual information within the real environment. In turn, the apperception of the AR object causes one to become complicit with the device and reconstruct their understanding of the space. The presence of virtual objects redefines space. Moreover, direct confrontation and assimilation with

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the virtual object causes the repositioning of physicality and acclimatizes neuronal activity. As a result, the real world transforms into an augmented reality.

4.2 Shifting Perceptions

The creation of AR situations requires a methodology of a creative process for exposing art motifs and formulas, exploiting locative space, and generating experiential discovery, in order to situate consciousness (Dolinsky 2004). The aesthetic moments in an AR experience are multi-layered ascertainments of locative spaces, artistic designations, and psychic dilemmas. It is in the process of locating the artwork and identifying its existence that generates experiences that are geographical, corporeal, and subjective. A confrontation with AR combines the experimental moment with conscious awareness and offers a shift in perceptions. Offering heightened awareness, this sensation becomes an extra-marginal moment in an intellective engagement, or a perceptual shift (Dolinsky 2004).

A perceptual shift is the cognitive recognition of having experienced something extra-marginal, on the boundaries of normal awareness, outside of conditioned attenuation. Promoting a "perceptual shift" for the visitor is a historical tradition in some art forms that aim toward altering perception. Perceptual shifts are often provoked by such art as trompe l'oeil, Cubism, Cornell boxes, labyrinth gardens and Brecht's political theater. These motifs are a motivation to exploit AR as a virtual environment. As a type of interactive media, AR has a quality that requires a specific engagement unique to the peripheral devices and its ability to situate particular artistic performances. Once the visitor becomes complicit in his or her role within that interaction relationship, possibilities are expanded for cognitive recognition and perceptual shift. The work may not necessarily attempt to shape emotion in particular; however, confrontation with the AR experience shapes perceptual possibilities and alters how we situate our self in relation to virtual environments.

The most important performance measure of effectiveness for media experiences is psychological immersion. Psychological immersion occurs when a visitor's senses are so aroused by the virtual experience that their emotions and intellect react as if they are in the actual world or participating in another world event (Rosen et al. 1994). We are most familiar with this phenomenon as we tend to weave ourselves into the plot of a film or a drama, and more recently, we may weave ourselves into the real and/or imagined plot of a video game or an XR (extended reality) performative event. AR art offers a sense of immersion when a locative activity engages the visitor in transforming a seemingly neutral, albeit public space into a subversive and aesthetic communication scene.

AR art allows us to incorporate virtual objects into our physical space and promote psychological immersion by repositioning our body's physical relationship to the world and moreover, affecting our emotional thinking. As a result, AR can restructure mundane existence. In AR, we must construct an understanding of how the 3D computer graphical object consummates with our world. Through psychological

immersion, we gain an understanding of how we function in relation to its ubiety. We consider rules that were previously transparent and permutate them to orchestrate a shared sense of augmented reality. The integration of imaginative virtual art objects in public spaces not only gives us the opportunity to experience an "other" type of "being" in the world, the space itself exists as both real and virtual (Virilio 2002). This recognition of the transformative environment allows us to reconsider representations in our everyday world and our own relationships to them (Dolinsky et al. 2005).

In order to achieve psychological immersion, action is key. Interactivity is critical for optimized enjoyment. Action enhances the sense of immersion and the efficacy of the aesthetic expression. Here, the confrontation precipitated by AR art stands as an action reaction chain of events of discovery and integration. The AR sets up an opposition between physical and virtual, the material and the computer generated, reality and extended reality. Starobinski (2003) carefully articulates the coupling of action and reaction and writes how the metaphoric use of action and reaction "lends an air of normality and naturalness to the relationship between idea and motion, that is, between the soul and the body." The work, Heart to Heart, presents a psychic dilemma through search and recognition (the action of finding the answer to "where is it?") and situates the visitor through a conceptual integration: the reaction of incorporating the action into one's knowledge and life experience.

Standing alongside the AR art, "Heart to Heart," in People's Park in Bloomington Indiana amidst the global Occupy events, I chanced upon an encounter and confrontation with a stranger. This struggle to remain immersed within an augmented environment and to integrate strange questions led to what seemed to be an exponential disruption. During the engagement in the virtual world, a conversation occurs in the real world and situates myself as an extension of the virtual world with the other who is a stranger in the real world—here, a park. The stranger pointedly asks the AR seeker and device holder what they are doing in the park. Both persons' thoughts are dovetailing in a strange manner, but they seem to understand one another all the same. The dream like descent into an AR experience and the indulgence into its reverie can be infused by the proximity of a stranger. This nose-to-nose juxtaposition intensifies the immersion of the space for both parties. Somehow, they each stand their ground and stand together while parlaying a conversation. They are listening to one another, engaged in a discursive rhetoric where they ultimately establish a private interconnected network. They achieve real-world immersion through location, aesthetic expression, and poetic discourse—sharing a multiplicity of complicity. Immersion occurs between the person and the AR object through the magic and the discovery of the artwork. Immersion also occurs on multiple realities as persons who are acting in relation to the existence of the AR artwork, some understanding its presence while others are reacting to their own presence without ever knowing that the world is actually augmented, as in the encounter when the interlocutor began our conversation.

A psychological connectedness to the art occurs when the immersion augments an emotional response between the grounding in the real world and the suspension of disbelief in order to integrate the AR world into our lives. This is gauged by the sense of presence. The efficacy of presence can be formulated in different ways.

Typically, presence is defined by a sense of being in the virtual environment instead of being in the space where the physical body actually resides (Draper et al. 1998; Slater and Wilbur 1997). Another definition of presence occurs when the experience is "tantamount to successfully supported action in the environment" (Flach and Holden 1998; Zahorik and Jenison 1998). AR can offer a multiplicity of types of experiences. The formost occurs in the initial situation with recognizing the AR art. The visitor becomes complicit in a magical moment that fuses oneself with the existence of the object and creates a shared space called augmented reality. My heart was racing in reaction to seeing it. I was mesmerized by the movement of the emotional mobiles or "emotables" hovering in the air (Dolinsky 2014, 2019). My emotions are lofted and aroused: the type of presence that depends on action and locates oneself within the virtual environment. This occurs when AR art becomes a part of physicality and conversation with another person, regardless of who realizes its existence. The AR emotability is a felt a presence.

By focusing attention, shifting perception, and directing consciousness, the AR objects become a localization of a virtual volume in space and a metaphorical ink mark that combines with the environment to lead to a type of virtual painting or aesthetic overlay integrated into the real world. The emotable objects can be realized as creating a virtual environment and establishing the action of a theatrical moment. The visitor has the responsibility to inculcate their degree of presence and assimilate the object accordingly. In effect, the creative process augments reality by incorporating AR art into the active experience of locative awareness and situates consciousness.

"The phenomenon of presence is based on the transportation of consciousness into an alternate, virtual reality so that, in a sense, presence is consciousness within that virtual reality" (Sanchez-Vives and Slater 2005). So, despite an object being simulated and not real at all, visitors can respond as if it is real by eliciting an emotional response and genuinely engaging with the virtual object. According to Dixon, "Virtual reality is all about illusion. It's about computer graphics in the theater of the mind. It's about the use of technology to convince yourself you're in another reality" (Dixon 2007).

4.3 Shifting Realities

A young skateboarder rolling past circled several times and slowed down long enough to ask "Is that a computer?" I was surprised by the question, perhaps some people do not know what this iPad is. I felt like an alien, holding an alien object, rendering myself an outlander and alien in the world. It was a surprise considering we were practically on campus. Regardless, standing, searching, the computer pointing up at a tree, reveals an illusion of a heart-shaped entity. The with the image of Lenin raising his finger is pointing toward the sky. The balloon is there! Lenin is there! Suddenly my heart was pointing to the sky: It is the arOCCUPY May Day exhibition and the "Heart to Heart" gently hovers with a sense of vulnerability (see Fig. 4.1).

Fig. 4.1 "Heart to Heart" arOCCUPY May Day 2012. Bloomington, Indiana, USA. Photo © Dolinsky 2012

Then, suddenly, out of nowhere, someone moves adjacent to my shoulder. With a slight swivel of my face, a warm breath pulses against my cheek. Turning completely, he comes into view. His breath reaches into my mouth like an ominous shadow rolling across a plain. Simultaneously, his voice is a soft growl and a matter of fact Indiana-Southern style whisper: "You're scaring people."

Alongside marking the scene with AR is now a newfound sense of presence. To be certain that presence is accompanied with disquietude, the man repeats himself. Taking stock of the situation in the People's Park, a place where transients come to linger during the day, I see the world continues to pass by. Now I pass from that world into the park, space invading alongside AR art and brandishing a compswauter device in the air. Clearly my swashbuckling antics are not appreciated. Perhaps it is the computer that concerns them: an object waving around, a screen exploring the environment and a stranger creating an unknown quiddity. The people in People's Park feel screened. I am a surveyor that is being subject to surveillance.

We look straight ahead, nearly nose to nose, eyes in essence touching. His sunburned skin, long hair and military garb appear war torn and weather beaten. He stands not much taller and he means business. He repeats himself, "You're scaring people." I do not move. My body is still as my mind registers standing close to this stranger. Our locked gaze continues, I reply softly, "I'm not scaring anyone. I'm looking for my heart." Immediately his body relaxes, he withdraws ever so slightly, makes a bow and returns to me. Moving in close, he replies, "Well, I'm looking for

my heart too." We began to have a consensual hallucination in a conversation of soul quest, symbolic language and sententious poetry. We each profess a type of pronunciamento regarding hearts. Two disparate sensibilities dove tailing around one another through conversation and confrontation and summing up with a profound sense of moment and space. It helps to further understand crazy. Contemporaneously, the discourse makes broken nonsense and perfect sense and ends in mutual satisfaction. It is as if there exists a private acquiescence to recognize a heart when it is present.

4.4 Subversive Confrontation

The discovery of AR artwork in a People's Park situates the visitor not only in a location but within a social structure that is transforming with both particular and random circumstances. The community transubstantiates the public area creating an ever-changing dynamic established by a flow of situations. The AR experience is situated not for this marginalized group of people but those who travel there in order to recognize the affordances of the computer graphics as presence, action, and relationships intrinsic to the reconfiguration of reality by the introduction of virtuality. Ascott states that "virtual reality corrupts and absolute reality corrupts absolutely, whenever the constraints and limitation of its construction are preordained, predefined or preset." (Ascott 2003) The search for AR art is a search for delimitation within space. One must begin to negotiate the space with an intrepid sense of exploration. One begins by searching the space slowly and more intimately than one would who is not brandishing a device. The AR visitor becomes aware of the space to discover the AR art but in turn may realize how fully present in the space we can become.

We can intensify our worlds experientially through an act of discovery with AR. AR systematizes Lenin as he hovers over People's Park in a heart-shaped computer-generated hallucination. Lenin becomes visible through a device and digital window that situates him toward the visitor in a relationship wrought with multiple interpretations of private, public, and social identities. The visitor is being fused in a subversive confrontation with a virtual object that references a history of social systems in a place called People's Park, a circumstantial public space. The majority of the visitors to the park are among the AR uninitiated and will never know of the heart's existence. Through an adventure in search of AR art comes a way of knowing a city, a neighborhood park, and its inhabitants. Moreover, AR upheaves a mundane occurrence in a park. By repositioning the visitor in the park with Lenin's effigy, a distance forms between the sense of self and the park. AR causes the visitor to recognize the existence of the object, assimilate the object with not only space but self, and form a reaction. The reaction modifies self, park, and self with art. Step-by-step, beginning with an invitation to discover the AR, the visitor finds a way to identify the work and identify with it alongside the streets. Each of the elements of this process intertwine one with another to create an experience of multiplicity and action that involves space—artistic space, cyberspace, and mental space. Virtual reality enhances reality (see Fig. 4.2).

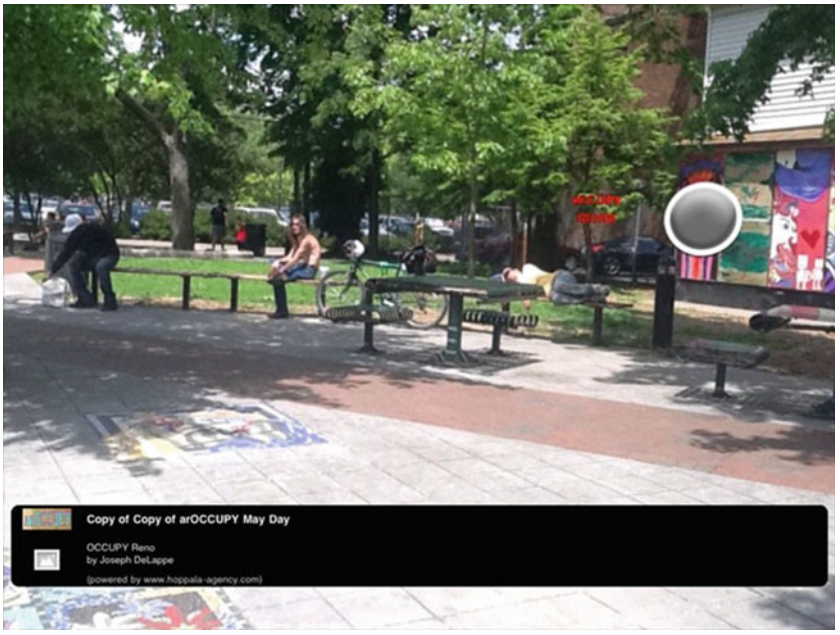

Fig. 4.2 People's Park in Bloomington Indiana during the art exhibition, arOCCUPY May Day 2012. Many of the people gathered to the left side of the park when they saw a stranger in the park walking around pointing an iPad. As a result, the benches and tables on the right side of the park are empty. The upheaval in the air can be seen literally, figuratively and virtually with the hovering AR objects. Photo: c. 2012 Dolinsky

The visitor becomes complicit in the AR artwork by attending its exhibition in the park. The visitor is yet another entity, hovering among with virtual entities, recognizing the existence of others. The visitor, through the act of a sojourn, becomes the augmentation of the day. The AR visitor becomes the extra (XR) entity that affords discovery and assimilation for the regular inhabitants of the park. AR and its acolytes are shifting the reality and the perceptions of the people in the park. Those who visit AR have the potential to be labeled as an outsider and to become suspect in their activity.

The irony compounds itself as these events occur on May Day. May Day coincides with International Workers' Day and typically involves rallies and peaceful demonstrations in support of laborers and labor rights. On May Day 2012, there were two different demonstrations occurring in the People's Park. One demonstration was the exhibition of AR art, and the other was the demonstration by the people who rallied to complain about the presence of a stranger, specifically the AR acolyte in the park.

"arOCCUPY May Day" was an AR art exhibition and subversion directed and produced by Mark Skwarek, a faculty member and researcher-in-residence at Polytechnic Institute of New York University. Inspired by New York City's Occupy movement, Skwarek re-built the encampment in AR. He extended the encampment by

inviting artists to create AR pieces that would enhance efforts to support the Occupy Movement. AR allowed him to situate the protest in cities across the USA as well as across the world in such cities as Sydney, Australia, Brasilia, Brazil and Hammam Sousse, Tunisia in Africa. The exhibition reached as far as Shanghai and a photo was smuggled out of China in support (see Fig. 4.3) (Skwarek 2012). Lenin is being reintroduced to a new generation of social activists (Žižek 2002, 2004; Kellogg 2014) through reprints of his critical writings composed from the overthrow of the tsar. The choice of using the image of Lenin on the arHEART is motivated by a Ukrainian heritage. Ukraine was an independent nation in 1917 when it was invaded by Lenin's Red Army. By 1921, Lenin began to give Ukrainians back some of their independence by allowing a national revival movement that celebrated their customs, language, arts, music, poetry and Ukrainian Orthodox religion. However, this was short lived when Ukraine was devastated in 1929 by Stalin who imprisoned and/or executed leading scholars, scientists, and cultural and religious leaders by falsely accusing them of armed revolt. This was followed by the Holodomor, Stalin's forced extermination by hunger in 1932–1933. The arHEART at arOCCUPY MAY DAY is a testament

Fig. 4.3 Documentation from Shanghai arOCCUPY MAY DAY of the HeARt. This was a very difficult photograph to secure and was sent to the USA from Shanghai, China during the May Day worldwide protests.
Photo: © 2012 Anonymous

Fig. 4.4 Heart to Heart arOCCUPY May Day nestled in the trees of Bloomington, Indiana. Photo: © 2012 Dolinsky

to the strength of heart of Ukrainian people. The ephemerality of the arHEART is a pointer to the extreme changes of heart that the Russian leaders demonstrated toward Ukrainians. As a result, the arHEART flutters in many cities, in the air, in the park and in the sanctuary of nature, pointing toward a place of renewal (see Fig. 4.4).

The creation and placement of AR art is integral to provoking an experience and causing a shift in perception. Presence, realization, and communication are established through an aesthetic juncture. Placing the object in a particular setting co-locates aesthetic production, social milieu, and subversive confrontation. AR affords an opportunity for an experience that facilitates an earnestness of space and place in the community. AR artwork helps to establish a relationship to a location, alters that space, and invites spectacle. That experience situates consciousness and forms memories of the artwork that reconfigures the self, the emotable, and the location.

4.5 Shifting Spheres

The shifting of spheres between reality and virtuality is evoked in the AR artwork displayed at the Adler Planetarium in Chicago called “Seed Robots.” Aptly positioned in a museum that focuses on the spheres moving about in the sky, the Adler Planetarium in Chicago investigates the universe.

Moon Lust, as described on the website, "is a speculative project that explores global interests and issues pertaining to lunar exploration and habitation" (Moon Lust 2012). The curated exhibition was organized by Tracy Cornish in collaboration with Todd Margolis and augmented reality visualizations were shown at the Adler Planetarium in Chicago during the summer of 2012. The show facilitated a dialogue about space exploration and habitation by introducing AR on such topics as lunar mining, space tourism, celestial territories, space ecology and policy.

"Seed Robots" is one of the installations in Moon Lust, and it focused on robots that enable joyous living in the lunar atmosphere. The Seed Robots plan, organize and build a person's lunar comfort zone. Part artificial intelligence, part architectural unit, the Seed Robot is a companion, a home and a workspace. Their motto is, "We have grown the Seeds to meet your future needs." See Fig. 4.5.

The Seed Robot will arrive on the moon before its corresponding occupant does. The Seed Robot sees to all human needs while anticipating the occupant's arrival. The Seed Robot begins their life as a tiny pod that is connected to the occupant's mobile communication system. As an auxiliary information data collection device, the Seed Robot accumulates and processes personal information. This information is collated, examined, and translated to determine an occupant's ultimate pleasure zone. As the data is being processed, a small display will appear above in the occupant's mobile communication system that indicates information is being processed in order to hone the occupant's preferences. There is no work on the occupant's part, this information collection system happens effortlessly and provides entertainment fully unique to individual personality style and body movements.

Once the seed is fully calibrated to a specific biographical and psychological profiles, that seed is launched with other seeds to its destination in a dedicated section

Fig. 4.5 Seed Robot shown as a digital painting and as an augmented reality visualization at the Moon Lust exhibit on speculative lunar exploration at the Adler Planetarium, Chicago (2012). The exhibit was curated by Tracy Cornish and the collaboration of Todd Margolis. Digital image: © 2011 Dolinsky

of the lunar surface. It is implanted in the moon's soil. This seed develops into a small robot that propagates other small robots who in turn build larger robots. These robots generate energy sources and raw materials. They then collect, design and arrange various building materials. Some robots manufacture these building materials on the spot. Others use those manufactured building materials to create the personal dream lunar location. In effect, the tiny Seed Robot builds a slightly bigger robot that in turn, builds an even larger robot and this occurs generatively. Creating their own evolution based on the personal data, the robots are exponentially generating and evolving to become a final robot which is the proper home.

In this installation, augmented reality is used as speculative device with a promise to improve our lives. The Seed Robots provide an augmentation to our world by providing a window into a future world where devices that are similar to those in use today will provide for all of our needs. Indeed, in our world of devices that allows us to assimilate multiplying images, the future with the Seed Robots promises a world that tranforms a human/machine duplicity into a world where the device feeds, clothes, and houses the entire being. In effect, we are ever lusting after a place to occupy, and for that destination, that space, to fortify and occupy us.

This subjugation between human and device is a reflection of the dynamic found in virtual worlds, augmented reality and extended realities. By inhabiting virtual spaces, we seek a place to occupy. This occupation can help establish an admirable identity, and we longingly hope that it provides us with much needed solace. Since that solace is fleeting or unobtainable for the moment, the thrill of the chase or the seeking becomes the constant dynamic and devices provide a safe space to exercise our desires and reveal some portion of our identities with an authentic voice.

The Seed Robot's design begins with a drawing that becomes a digital painting and then transforms into a three-dimensional design which lives in augmented reality. The act of drawing helps the artist to process the world and its accompanying emotions and becomes the vehicle for design and a revelation for expression (See Fig. 4.6). That expression becomes dynamic through dimensional software and locative entertainment that is augmented reality. The entity becomes a gateway back to the real world as the artwork is shared between artists and visitors to the virtual world. The visitors catapult themselves with a sort of trepidation onto a path of intentional and directed discovery in order to approach the augmented world. Once in AR, the visitors confront the virtual entity to have a virtual conversation which can be a visual moment or a personal dialogue or a shared moment.

4.6 Conclusion

Artistic expression through portraiture is a strategy to bridge socio-political confrontation in a specific location using augmented reality. The conceptual ideation of exploring an expressed opposition to social and economic inequality by employing socio-political confrontations with aesthetics by using AR is explored during the

Fig. 4.6 Seed Robot shown as augmented reality artwork at the Moon Lust exhibit on speculative lunar exploration at the Adler Planetarium, Chicago (2012). Image: © Dolinsky 2012

Occupy movement and the Moon Lust exhibitions. Although they are unrelated exhibitions, the methodology of combining portraiture, AR, and subversive confrontation allows technology to be a point of exploration and a moment to contemplate the world, our place in it, and the future. Augmented reality as a moment in space and as a speculative reality in place is invoked by data machine economies, artificial intelligence, and data mining robots. The technology locates us as beings and places virtual emotables into our conciousness. Augmented reality allows us to explore how virtuality informs our reality and AR's aesthetic poetics allows us to create a multiplicity of interpretations for our perceptual, social, economic, and conscious awareness.

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Chapter 5
Augmented Reality, the Expansive Object, and the Vivification of the Memory Theatre: Field Notes

Michael Rees

1. Conceptual Artists are mystics rather than rationalists. They leap to conclusions that logic cannot reach.
2. Rational judgments repeat rational judgments.
3. Illogical judgments lead to new experience.

Sol Lewitt, Sentences in Conceptual Art, 0–9, no. 5 (January 1969), pp. 3–5.

"But then, I presume, you spoke on the premise of informing others, whilst I want you to speak with the conscious intention of educating yourself, and so perhaps both rules of thumb can be valid…"

Heinrich Von Kleist, On the Graduate Completion of Thoughts during Speech. UDN|United Designers Network, Berlin London, San Francisco.

5.1 Introduction

This chapter will examine objects in relationship to augmented reality (AR) to open up the territories they connote. In my exhibitions *Synthetic Cells: Site and (Para)Site* (2018) (Fig. 5.1) and *ClownTown* (2016) (Fig. 5.2), the object is inseparable from the AR experience, as they are conceived as a total artwork (gesamtkunstwerk) made up of the sculpture, the two-dimensional image, and the augmented reality interaction. This chapter might be considered one extensive footnote to the works in *ClownTown* and *Synthetic Cells*.

The art object is a sophisticated storehouse of memory that contains contextual information that helps people apprehend its nature. In this context, AR creates a complex semiotic which begins to problematize, explore, and enlarge the imaginative

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Fig. 5.1 *Synthetic Cells Site and (Para)Site*, installation view. Photo by Ken Ek, used with permission

Fig. 5.2 Concept 3D Sketch for *ClownTown*. Photo by the author

connection between people, systems, and things. By semiotic, I mean a jumble of signs, each changing the last's meaning, context, and framework. But AR, unlike a collage or a painted composition, unfolds in time and, uniquely, with some viewer agency and interaction.

AR can be a portal and a library of imagination and thought. It is an opera, a destabilizing mélange of subjectivities, loosely hung on the framework of their object-ness. It represents the possibility of digitizing everything: knowledge and experience; science and culture; and the consolidation of a world in which every location, target, object, and scene is tagged or transformed into a link. These links can lead you to anything, a comment, a movie, a poem, a 3D object, informational, political, psychological, and so on. AR literalizes the theory of extended cognition, where the brain does not reside entirely in mind but is part of a cognitive process that enlists the world.

This chapter is not concerned with more utilitarian uses of AR such as television graphics overlaid on news broadcasts, first-down markers in football games, or apps where cloud movements pass over geographical maps. Instead, it focuses on its use in sculptural projects.

New technologies carry with them not just tool status but broader referents. They liberally reflect the inquiries of other fields of knowledge and herald conceptual frameworks that suggest unique philosophies through their examination. One can sense the musings of speculative realism and the philosophy's renewed focus on the object reified in AR. One could also include ideas in physics and biology. And yet, the notion of extended cognition exampled by a memory theatre or memory code, one of the oldest tools of the human mind, might be the clearest metaphor for AR. A memory theatre is a mnemonic method whereby what needs to be remembered is systematically mapped to a location, sometimes an imaginary one built in mind. In the new technologies, the memory theatre is updated to an extreme spatialization mapped upon location through digitization. A difference to the memory theatre remains in that these are not written into our brain but into the programmes that employ them.

This essay aspires to bring various forces or influences to bear as we contemplate what AR affords. It is not only a nifty technology to advertise and present information, but a deep integration of the mind into materialization. Far from being only an analogy or metaphor of the mind, it is a synecdoche in that it represents part of the cognitive process to access the more extensive process. Please note that a synecdoche is a figure of speech that uses a piece of what it would describe as a stand-in for it. "*The white hairs winter in Florida"*. In my imagination, the various forces working on the object and its augmentation include extended cognition, memory codes, panpsychism, atomic theory, and even computing itself.

Within the framework of a memory code, the state of the object and augmented reality are intimately associated. In sculpture, this association of object plus image plus augment becomes a rich platform of experience. It manifests from the physical to the virtual analogous to how an object is mapped to the imagination (a more organic process). The difference with AR is that you see the transformation rather than visualize it. This sculptural platform is an extension of how sculptures have been used heretofore. It implies multiple binary relationships: object to subject, actual to

virtual, physical to metaphysical. But AR reifies this process and collapses into a unified yet strange experience.

5.2 What is Object?

The presence and trajectory of objects are vast. What are humans without objects? For the tool-building species, objects are survival and carry multiple purposes and intentions. My take on these phenomena and their relationship to technology is to tie them to the idea of valence both in chemistry and linguistics. That seems relevant because it blends natural processes with cultural experience. These thoughts emerge as a response to what has changed in the technological realization of form because of 3D printing. We need to establish how things have changed about the sculptural object.

Firstly, objects have become graphical with the advent of computer 3D design. This process of designing 3D becomes highly mediated. An object could just as easily be sets of specifications as simple geometric constructions as parametric instructions (a computer-aided design technique that refers to the use of parameters or variables that are edited to alter the result of the design.). Although not the work's intent, Joseph Kosuth's work "One Chair and Three Chairs" demonstrates what is commonplace to computer practice, namely that code is fluid and could be represented as easily by one thing as another. The same question is at stake, "What is a chair?" This is hardly a question in the information age as it points up the fluidity of information. It is de rigueur that context and the creation of meaning specify the representation. It also assumes that specifications—the geometric constructions and the parametric instructions—are added as one of many possible representations.

Working in 3D design programmes is already a communal act: there are other people in the design space with you. The software platform comes from teams of people making tools to design things. The design is technically complex and intimately connected with the computer environment from which it has come, an enormous mélange of operating systems and specifications, not to mention hardware (Fig. 5.3). This complexity is always true of objects, whether made of clay wood or steel, modelled, carved, or assembled. After all, someone had to harvest the clay; someone had to cut the wood; someone had to make the steel.[1] But something about the technical presentation of computers, the in-house portal to the world, made this especially piqued for a sculptor in the 1990s and more extensive.

Artisans may have rich recipes for making their exquisite handmade relics, but the algorithmic is a bit different. It lacks intimacy while it has scale and reach. It speaks the language of possibility while complying with modular units of code. If this is not new, it is a significant addition. Here are the phenomena of the object, fixed in space

[1] Although written for the purposes of advancing a libertarian agenda, Leonard Read's I Pencil from 1958, is illustrative of the complexity of manufacturing taking a simple pencil as its example. https://fee.org/resources/i-pencil/.

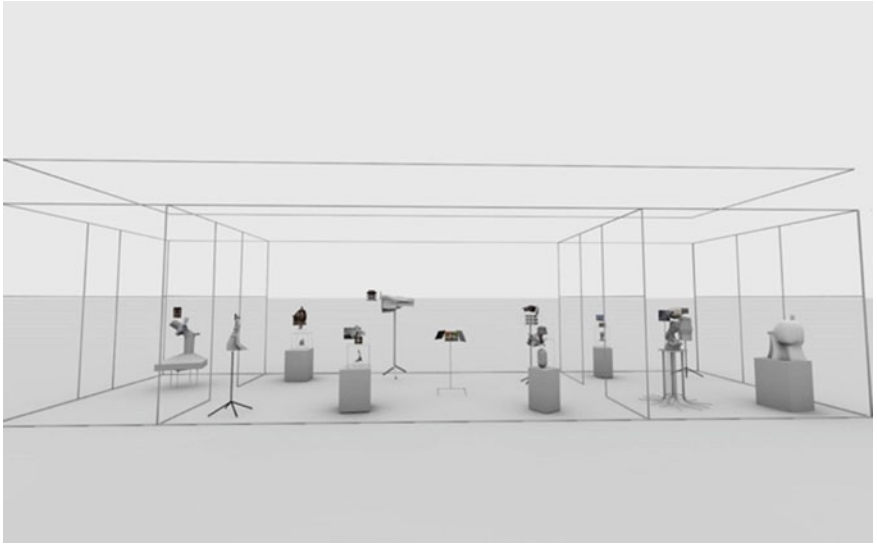

Fig. 5.3 Concept sketch for *ClownTown, 2016*. Image by the author

with its attendant memories, knowledge, psychology, politics, information, history attached. One can imagine these as the object's valences.

An object is emblematic of vast information, on consideration, much more than we might expect to be "stored" there. All of these boundaries and borders are the valence of objects. These are the many energetic levels of an object, or artwork, that although invisible, are communicated by its presence. They are in the history of the time that created the piece, or the artist's biography; or they can offer a sense about the intellectual processes surrounding the work, the poetry of the piece, or the intent. These valences lie deep in works, and they encompass all of the filters that people may use when they view a sculpture. As in atomic theory, a valence functions as the location of closure and interaction.

Valence is the path of electrons as they move around the nucleus of an atom. Different atoms have different numbers of valences that are called shells. These are also where atoms join with other atoms to make bonds. It seems an apt analogy that works of art at a larger scale have valences, their own complex sets of relationships, shells, and layers. These include material ones that form the physical presence of a sculpture as well as the immaterial, conceptual, linguistic, and energetic values. An object carries its history, valences, and all the intentions and experiences of the audience, the critics, the historians, and the maker. The legibility of these qualities gives an object its meaning and accent. These component parts act in concert to create energy around the thing. Energy is the framework created by the object, and it further informs it. The energy is both phenomenal and informational, but it is palpable. Objects are a repository for some non-physical parts of their presence.

It is also helpful to think about objects in the context of a palimpsest. Imagine a palimpsest and the valences of the object as being two aspects of the same phenomena. Using computer-aided design (CAD) and rapid prototyping processes allows artists a new way to realize dense form and thus more complex content. Using this technical opportunity enables artists to load the sculpture with opportunities. It seems a two-way street, content loaded into the object as part of a form-finding exercise and the object forming the way the content is expressed. The work and its content are a palimpsest which has this multi-valent quality.

Another aspect of the word valence is fitting. In linguistics, the term describes the number and type of arguments that a word, especially a verb, can combine in a sentence. It is drawn from chemical valence, if only metaphorically.

These are two critical aspects of the state of sculpture as an object of interaction. One is chemical or refers to its physical condition, and another is linguistic and refers to meaning within this state. In this construction, the object functions as a kind of relational meaning complex grounded in its physical being as quickly as its metaphysical state.

Despite the technological object reinventing multivalence against the backdrop of 3D printing, my first experience of this was older: Donatella's "David" in the Bargello Museum in Florence. On seeing it in the flesh for the first time in 1993, I had a kind of extended sensory experience. I could feel the air around it buzzing. It took me over. I could move into and out of the buzzing by stepping away or closer. The buzzing was some kind of information, maybe an auditory and sensory hallucination. I could sense the myriad pages that have been written, the histories that have been verified, the speculations that had been proffered, the people places and things that have absorbed it, or that the sculpture itself had pressed upon people places and things. In short, I sensed its metaphysics. I experienced, in an extrasensory way, an augmentation, the object trying to keep up with the information or the information trying to keep up with the object. It was hard to tell what was richer. I experienced all this as the location of a complex of knowledge and memory and its presence as a celebrated aesthetic.

Author Lynne Kelly expounds on something similar in her book on Memory Codes (Kelly 2018), explaining insightfully that the English rock formations, such as Stonehenge, were memory prompts that contained essential survival and cultural information enacted by performance and ritual. She suggests that it is likely that no aboriginal culture was without a memory code where the knowledge of survival and belief were preserved in sophisticated strata committed to memory through song and ritual. Examples abound in the Lukasa memory boards of the Luba peoples (Fig. 5.6), the song lines of aboriginal Australians, the Quipo, a knotted string from the Incans, and so many more. The innovators of these codes have essentially the same modern mind that we have but cultivated in such a different environment.

Like the fish trying to understand water, we are swimming in our alloyed relationship to objects. They are everywhere, representing everything. It is also important to realize that this overarching influence touches other areas of our worldview.

Kelly's examples demonstrate the fullness of how objects are used, and there are so many more, especially with the development of the information age.

When we discuss memory storage in objects, it might seem to pull up next to something akin to vitalism, but that is not what Kelly is suggesting. It is tempting to anthropomorphize the things around us either through pareidolia, projection or habit, if not by the tendency towards magical thinking. How do we resolve this analogy in ways that are not rhetorical or have supernatural recourse?

A key element to the object and its contemporary vagaries is the theory of panpsychism. It is the idea that all matter is imbued with consciousness, "perhaps intrinsic to all forms of information processing, even inanimate forms such as technological devices" (Harris 2019). Some scientists have started to take panpsychism seriously to unfold the mystery of consciousness. Harris continues that "consciousness stands alongside the other fundamental forces and fields that physics has sealed to us—like gravity, electromagnetism, and the strong and weak nuclear forces". This theory seems difficult to swallow. Some people who have written about panpsychism acknowledge this in their titles, for example, Philip Goff's "Panpsychism is Crazy, but It's Most Probably True" (Goth 2017).

So, is a rock conscious? The bronze of the sculpture? Inflated vinyl? Augmented tablets triggered by photo markers? It is hard to imagine they are aware in the same way we are, yet one can enlist them to fashion meaning and hold memory and history. As an artist, it is possible to imagine collaborating with material to make it work. So, for now, it is worth enlisting this theory, too, as we examine the art object enlivened by its metaphysics but also with the overlays of information that AR affords.

It feels like these many methods of storing memory establish them as equal parts physical and metaphysical. The metaphysical in this use are the intentions, abstractions, mediations, and meditations that are triggered by, or stored within that object. It is curious to note that the engineers that create automatic manufacture, computer-aided design, and animation software parallel the musings of other disciplines. Jean-François Lyotard's Les Immatériaux, where theory, conceptual frameworks, and intellectual arguments meet specific practices and stagings, seem to have anticipated our current practice (Dimitra 2015). In another example, object-oriented ontology, or speculative realism, does interesting things to objects and metaphysics but indisputably reinvents our interest in them. These tendencies weigh heavy on the sculptural object and influence it deeply in contemporary practice. Enter AR.

5.3 What is Augmented Reality?

It would be disappointing if these notes gave the impression that objects and AR are in binary relation to one another, a sort of hardware–software construct, although it is one way to think of it. Thinking back to the atomic theory analogy, one need not go far to consider the augment as a valence of an object, but there are still other ways. If we reflect on Graham Harmon's object-oriented ontology, everything is an object and object relations (Harmon 2002).Perhaps the elements of the sculptural platform cooperate in some "form of information processing", translating whatever is available from one sculpture towards a photo, towards an interactive piece, and

Fig. 5.4 *Earth, TV*, *Cross*, 1981 early sculpture made from compacted earth, wood, closed-circuit video. Photo by the author

around again. Objects enact a broad array of activities, but especially they frame memory. As memory enactors, triggers of sorts, they may simply be augments. This experience is not new, existing before the advent of technological augmentation, but AR seems to reify it.

My first augmented work was Earth TV Cross (Fig. 5.4) which I later understood as the technological and physical colliding together. At the time, it stood out as an outlier of my sculptures from that period. It seemed to lay dormant all these years only to be redefined by these new experiments and the availability of AR technology as the precursor to these investigations.

AR is the reification of a process storing rich digital associations that activate a hardware-software combination. It is a specific technology that extends physical attributes to produce a composite experience of the viractual. According to Joseph Nechvatal, "Viractuality is a theory that strives to see, understand, and create interfaces between the technological and the biological" (Nechvatal 2010). So, the technological scene as it is represented in the virtual interface can be activated by 2D triggers, 3D triggers, geolocation, surface detection, or trigger-less tracking as catalysts to load any kind of digital content into an app. In the Synthetic Cell series and the exhibition *ClownTown*, tablet computers with custom software designed via Unity (a game engine) and vuforia (a plugin for Unity) (Fig. 5.5) create the effect. In those exhibitions, images are used for triggers. The images are often fixed to a sculptural piece either printed on its side or affixed to different appendages of the sculpture. Then, they are programmed to link other forms of information to the viewer. The

Fig. 5.5 Walking pig in Vuforia application on a tablet computer, *Synth Cell* 003, *China Wall, Pig*, 2018. Photo by Ken Ek, used with permission

information can be interactive or fixed and present in any media that a computer, phone, or tablet can represent. Its rich interface adds information to interact with the world.

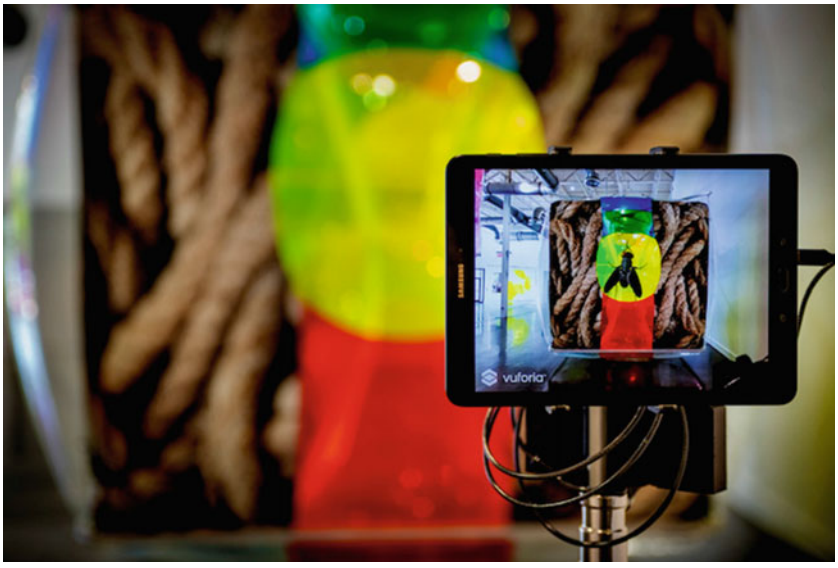

Fig. 5.6 *Synth Cell* 013, *Rope, Fly*, 2018. Photo by Ken Ek, used with permission

AR has notable inferences. Firstly, it is a constructive medium. Unlike the famous (perhaps mythical) story of the Lumiere Brothers film of the train heading into the audience and the audience's panic-stricken reaction (Grunhauser 2016), it does not present itself as natural or as a suspension of disbelief. It seems the viewer would always consider what the app offers to them is artificial. Whether it is a walking pig (Fig. 5.5), a common housefly (Fig. 5.6), or a virtual sculpture that can be gesture navigated, whatever event comes into the triggered AR app seems to be an addition to the physical reality. It is not mistaken for the real, although it may supplant or subvert it. Instead, AR appears to start with a question: what is this (the world view available in the camera's viewfinder) doing with that (the augmented experience that composites itself over the world view in a kind of collage)?[2] That is a question that belongs to the viractual.

Despite this question, the first time a person experiences AR, something strange, miraculous even, has happened. It is digital magic as if the artist's thoughts, their imaginings have manifested as a screen-based experience wrenched from the physical scene as rich synesthesia. Although it is hard to say how it is different from previous manifestations of the artist's imagination and to call that new, the virtual and actual appear as strange bedfellows.

Of course, the mechanism is something more pedestrian than that. It is the programmed experience of the artist or author as they make the target of an object or a picture become a link to further information. But there is still a textural strangeness about it because it is that digital pixilated visual laid upon the flattened (by camera or viewfinder) space. But something important has happened. With its ability to link from one thing to another, for example, a word to a video, the Internet is now located in a real-world site. It is the opposite of what happens on the World Wide Web, where one can access the links from any computer. In an interesting reversal, the link has now become located to the place or the image marker. It has become a site-specific link available from the programmed view.

Even so, its strangeness is multiplied in another way by the overlay of the digital, physical, and interactive information that shows up on top of the real scene. It becomes a portal that transports the viewer to a place other than the one the viewer is immediately in. It adds layers of abstraction and unrealness—strangeness—to the experience. This is part of the constructed artificial. This sense that it is a portal is pronounced because of the illusion that there is a real scene behind the pixelated digital.

The technology also affords that this same trigger can act as a channel for other AR projects. For example, six different artists contributed augments to the triggers in *Synthetic Cells Site and (Para)Site.* In other words, the link may be split in to as many different experiences as people are interested in adding. This technical opportunity is fairly profound, as demonstrated in the following example. A controversial site where multiple histories overlapped can be channelled in this way to create an

[2] Many people take the augment to be as real as what you see in the world, or as real as what is in the tablet viewfinder (augment plus viewfinder). It's an issue that I leave unresolved and am using these terms to peel apart what one experiences. My use of "real" is only an expedient term. Nechvatal's construction of the biological and the technological is more apt.

official narrative plus the narrative of any sufficiently interested group to interrupt the previously scheduled programming. The site of the AR work becomes a portal for multiple other experiences available to the viewer in this space. Here, AR reinvigorates real-world sites antithetical to how sites are neutralized on the Internet. It enlarges the physical site with any kind and number of experiences that are not native to it and extends the notion of a link to be further divided into other channels.

In *Synthetic Cells,* each augmented target became a portal to the artists' experiences: Epigenetics, John Craig Freeman; an ASMR experience, Will Pappenheim; Lucy Trackball, a comedic character, Carla Ganis; The Monument App, Claudia Hart; Gardens of the Anthropocene, Tamiko Thiel, and Only As Beautiful as the Objects it Reflects Chris Manzione (Schneider et al. 2020).

Put against the backdrop of objects, AR seems to be the perfect complement to these developments. AR allows a dynamic semiotic that are metaphysical and transformative of the physical object or 2D target that invokes them. They give rich associations which the viewer must assemble. Regarding this instant semiotic, any sign combined with another would create this resonance, but to carry it across media from the physical to the two dimensional to the interactive is somewhat novel. This expanding dynamic allows for direct storage of experience into an object that is accessible to the viewer with the appropriate technology.

There is no limit to the types of signs that could be included, but when it transforms into time-based and interactive works, the experience becomes drawn out. The sense that you are constructing the event as you are experiencing it is piqued. This is unlike the train that drives at the audience or the suspension of disbelief. There is never a moment when you take AR for real, for biological. It seems stranger than real.

5.4 Patterned to Fit Work: *ClownTown*, and *Synthetic Cells: Site and (Para)Site*

So, a work of art can be made in an entirely different way. Rather than the sum of its parts or the sum of the conceptual pressures working on it, it can be a leap, an irrationality, despite residing in a framework. This is true in both of the exhibitions *ClownTown* (2016) (Fig. 5.2) and *Synthetic Cells: Site and (Para)Site* (2018) (Fig. 5.1). Each partakes in irrationality. These shows were companion shows, siblings in my exploration of site, the object, and AR. They were musings on my collaborations with different forms of objects across multiple media. Because of the use of augmented media throughout the works, these sculptures had the sensation of being n-dimensional, a science fiction sort of space.

It is also true that each of the shows treated this viractual space as a piqued space to share wonder with friends or anyone else who cares to travel along to this strange platform. It is as if I've invited you to an invented theatre of possibility to come along with me to see a space together, to open up to the opportunities and wonders that it offers. The platform is this extensive, expanded space of the relations of objects,

whether material or immaterial, out into space, virtual space, and acting as a portal into the mind. We will get used to this just as we grew used to books. Still, for this moment in time, these digital apparitions associated with image and object are strange: unusual or surprising in a way that is unsettling or hard to understand.

What does a world of objects and their interactions with media portend? It is not the only contemporary question, but it is worthy of deep experimentation. These two shows approached the same problem from, on the one hand, a hard-to-understand obsession akin to postmodern literature (thinking of David Foster Wallace and his elaborate, end noted stories) and the other hand through joy. In joy, the contents of strange are present but restrained in favour of a more playful approach. The former would be *ClownTown* and the latter *Synthetic Cells: Site and (Para)Site.*

ClownTown (2016) was a comedic picaresque mediated by a sculptural interface. Each form contains a juxtaposition of imagery and augmented reality that plumbs aspects of Internet foolishness. The ludic tenor of the works in ClownTown points to anxious times and shifting definitions of the world, while a sense of fatalism in the face of political and economic surrealism suffuses each work. In *ClownTown*, the picaresque novel becomes the structure of a metaphorical house of mirrors.

The clown is an ideal subject of this type of novel, for as one contemplates the visage, one cannot help but be struck by the initial problem of the clown's face. It is two faces: both a face and a put-on face, the human face and the painted face, the physical face and the augmented face. Because of the makeup, there is often one smiling face while the other frowns. The clown is implicated in each piece: what the clown wore, where the clown lived, what horse or donkey the clown rode, who the clown dated, what the clown said, and so on. But different accouterments appear alongside the clown in different states, further destabilizing the visage of the clown. These create ontographic aphorisms that contribute to the rakish clown and what we know of him.

ClownTown was an assembly of a natural history of materials and material culture techniques in the early twenty-first century. Forms were repeated across media as 3D printed objects, metal objects, and as repurposed interactive virtual objects that were skinned with images. A single form in different materials and medias was presented and represented, appearing here and there, and there again, but each time changed. Each time they were submitted to one or another form of computer representation. For example, the form *Long Stom* shows up in three different pieces: as a large plaster sculpture in "*Slappy Pappy: sleeping clown (thought bubble, speech bubble)*", (Fig. 5.7 left) as a cast aluminium 3D print in "*Long Stom Recursive (vintage clown pair[1] and long stom with happy and sad),[1] Big Bare Feet Vintage Clown Shoes from* http://bit.ly/2dhtuFH" (Fig. 5.7 middle); and again as the augmented interactive sculpture, texture-mapped with a sad clown face and a happy clown face in that same work "*Long Stom Recursive…"* (Fig. 5.7 right). The sculptural forms are carried throughout the show contributing to the sense of a house of mirrors where the presentation of the same form appears in multiple representations through the show. "*Abject Weather with Clown House and Kitty Ball*" and "*Abject Weather, Um and Ah, clown's mouth, winner/loser*" (Fig. 5.8 from left to right) are other examples. These objects come into and out of the clown's life almost randomly, certainly absurdly,

Fig. 5.7 Sculptural form "Long Stom" shows up in various sculptures and augments in *ClownTown*. Photos by the author

Fig. 5.8 Abject Weather in two sculptures, *ClownTown*. Photos by the author

contributing to the destabilizing effect of the combination of these various media but consistent with the picaresque.

These were purposeful juxtapositions as the show came to the exhibition in 2016 on Donald Trump's election eve. That is a watershed historical moment for the effect of social media on the psychology of the body politic. It referred to the strange role of social media in life and how things were rapidly changed. At that moment, a person

who had prepared to be the leader of the free world through the cultivation of expertise in multiple policy areas was overwhelmed by a remarkable media manipulator who designed to game media to his own benefit. The juxtapositions emphasized how the objects were just as slippery in the exhibition as language had become in social media.

This was especially true in "*Abject Weather, Um and Ah, clown's mouth, inkwell monkey head with winner/loser*" (Fig. 5.8). Once the augment was activated, an antique ink well of a monkey's head with a hinged cap opened and spun around endlessly, showing a sign that alternated "winner" "loser" in an endless gif. Visual logic often enacts the meaning of a single aspect of the work in multiple ways. So "winner", "loser" was as much about the election participants as it was us, as it was the stakes of digital media in the thumbs-up world of social media. Artists often use a single thing to stand in for multiple implications simultaneously, and they are happy to claim them all.

Other sculptures included "*Slappy Pappy: sleeping clown (thought bubble, speech bubble)"* (Fig. 5.9), where the augment was a hand-drawn picture of a thought bubble inside a speech bubble plus a speech bubble inside a thought bubble. It was activated by a Technicolor representation of the sleeping clown. The augment was a presentation of the dream of the clown as the clown is dreaming of "thinking of speaking" (speech bubble inside the thought bubble) or "speaking of thinking" (thought bubble inside the speech bubble) while no words are inside of any bubble.

Also "*Bitter Pill and Landscape Cube, Wrestlers*[1], *Mathematical Pony*[2]. [1]*Hercules and Antaeus, Lucas Cranach the Elder, 1530.* [2]*The photo texture of the pony is a sculpture made by Michelle Ray*", (Fig. 5.10) wherein an allegory of digitalia. Hercules lifts Antennas off the ground to separate him from the power the earth gives him while a strange math object appears with the sculpture of a horse texture

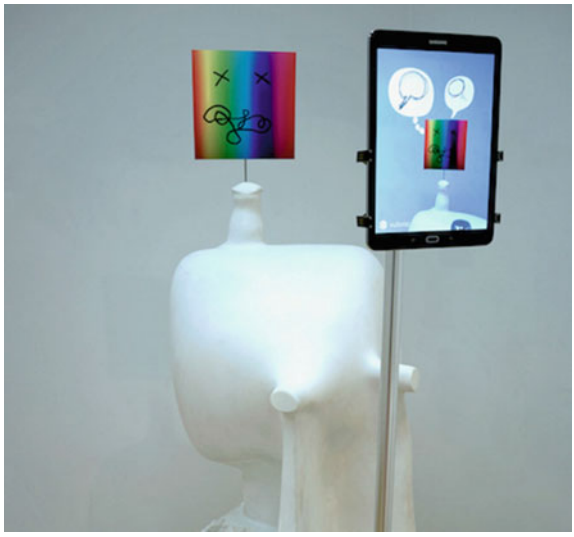

Fig. 5.9 *Slappy Pappy: sleeping clown (thought bubble, speech bubble).* Photo by the author

Fig. 5.10 *Bitter Pill and Landscape Cube, Wrestlers*[1], *Mathematical Pony*[2]. [1]*Hercules and Antaeus, Lucas Cranach the Elder, 1530.* [2]*The photo texture of the pony is a sculpture made by Michelle Ray.* Photo by the author

mapped to its surface can only be seen when the object is turned just so. At other angles, it becomes completely strange, elongated, fragmented, and broken. *Bitter pill* plays on the cliche phrase of a remedy you must pass through, while landscape cube is a simulation repeated across six surfaces, not of an actual landscape but a simulation. These combinations may or may not add up, may or may not make sense. As in the preservation of finitude, something is withheld—by the artist, object, facsimile of the painting, or their collaboration—never fully delivered as some part of the experience refuses to be translated. They seem to be conversing with themselves—a clownish house of mirrors.

"*Queue the music! Send in the clowns! In our farcetectural, internet of things, opinions have the same clown-nose shape form and weight and are equal to every other opinion no matter how scary or banal*" announces the press release (Rees

2016). Each work continues with its internal logic, hinted at by the titles of the pieces. The titles were more like an index than titles, where each thing is mentioned and footnoted as to where borrowed images came from, unless the images were anonymous. In *"Preservation of Finitude (clown[1] triggers jackass[2]), [1]Clown Torture, by Bruce Nauman, 1987. [2]Internet photograph from google image search "jackass" or "stubborn pony"* (Fig. 5.11), a documentary photograph from Bruce Nauman's "Clown Torture" (during the scene that the clown jumps up and down screaming "NO! NO! NO!") gives way to a picture of a jackass splayed across the surface of an abstract construction. It is a torturous narrative about the stubborn insistence of the artist to pursue the most arcane content regardless of audience access or understanding, antithetical to the etiquette of good communication in late-stage capitalism.

So many artists were influenced by this Nauman piece that its meaning morphed from Nauman's intent into its various receptions. It had become repurposed as it moved into its own identity, separate from Nauman. It had moved into language like the playful reiterations of children, latched onto and repeatedly turned until it was changed and inhabited by the players. As in an academic paper, it is a quote acknowledged by a footnote in the spirit of Fair Use. Many of the titles were lists of what was in the sculpture. There was the feeling that this show had been written into existence instead of moulded or made. In the sense that the entire show was in one way or another developed as some expression of computer code, this was almost literally true. But for the show's author, it felt more like the script of a movie, a play,

Fig. 5.11 *Preservation of Finitude (clown[1] triggers jackass[2]), [1]Clown Torture, by Bruce Nauman, 1987. [2]Internet photograph from Google image search "jackass" or "stubborn pony"*. Photo by the author

or a novel than an exhibition of sculptures. The objects became fluid, but the augment clued us into this fluidity.

> This inescapable clownish aura of ClownTown is felt as variously exuberant, silly, incompetent, abject, or grotesque. ClownTown looks into a sculptural condition stuck within a transformative trajectory that takes us from the existential to the artificial. The sculptures draw their audience through an ideational house of mirrors, deftly shuffling technologies, medias, images, and characters while playing in this serious game with one's sense of the real—Press Release for ClownTown 2016.

ClownTown was the obsessive, fractal intent to mine the ludic display of human behaviour across the Internet for artistic expression in a picaresque starring the clown. Later, *Synthetic Cells: Site and (Para)Site* sought to halt this critical approach and instead appeal to the viewer with joy while still retaining something strange within this sculptural platform. *ClownTown* made extensive use of AR as a house of mirrors to reflect upon the sculptural object in a social experience with a series of false equivalencies. On the other hand, *Synthetic Cells* layered up a sculptural pastorale which started from a generalized cell bred to a math object that telescoped out to animals and insects commensal with human environments. Although both had elements of absurdity and humour, *Synthetic Cells* were lashed together in some wild notion of the collaboration with conscious matter via panpsychism. Both shows were playful, but *Synthetic Cells* was consciously joyous, celebratory.

Synthetic Cells: Site and (Para)Site (Fig. 5.1) is chronicled in the catalogue of the same name (Schneider et al. 2020). As such, it is not necessary to repeat the same information here. *Synthetic Cells* was an exhibition of large inflated vinyl cells, many of which had a marker image on their side that enacted an augmented experience that was always an animation (the butterflies and ants and sometimes interactive the turtle, the rooster, the pig, the feet, and the fly (Fig. 5.12).)The artist-authored AR app was installed on a tablet computer held in place by a rolling tripod stand so that viewers could move from piece to piece. But it differs in crucial ways from *ClownTown* in its use of AR, which may explain how AR is folded into this sculptural platform. One key component of *Synthetic Cells* was the addition of other artists in the AR portion of the exhibition. So, the tablet had augmented apps from six different artists. From the beginning, the show started with biological metaphors as the plan was to host other artists' work on top of the image markers to create a show within a show.

There are different kinds of host–guest relationships in biology, including mutualistic, commensal, or parasitic. The parasite suggests that some harm is done to the host, although this is not true in all parasitic relationships. In the title's reference, *(Para)Site* exemplifies symbiotic relationships and takes off from the roots of the word: para comes from the Greek meaning alongside, besides, near, and so on. It may have been clearer to emphasize commensal or mutualistic relations rather than parasitic. Even so, the sense of an artistic organism in a conjunctive symbiosis with another organism is what the title hoped to imply.

We might amplify this to include augmented reality too. There is undoubtedly some symbiotic relationship to its host, whether triggered by the object, geolocation, or marker. In *Synthetic Cells*, the root experience was the first experience, the site (and sight) of the inflatable cells. Everything extends from there. The images were subsets

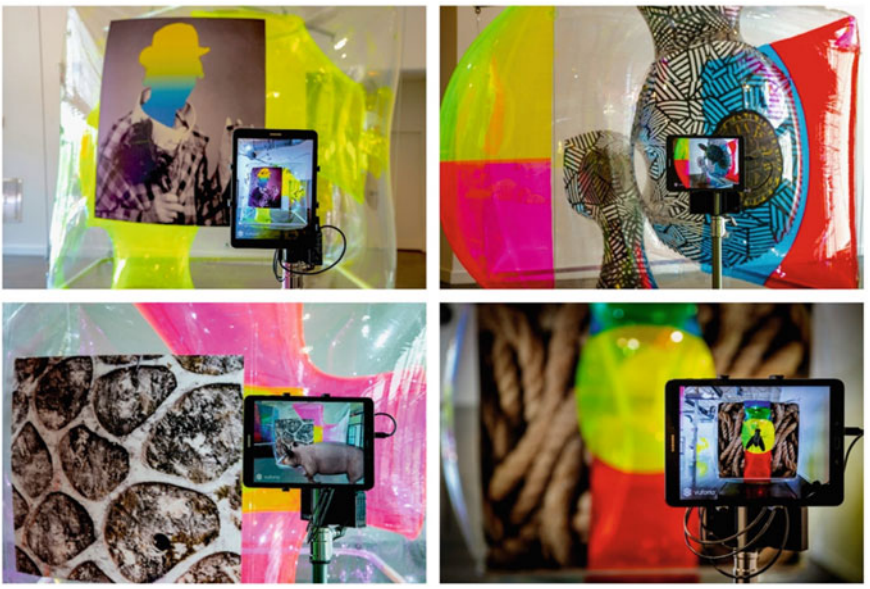

Fig. 5.12 Some examples of animals and insects commensal with humans from *Synthetic Cells: Site and (Para)Site.* Photos by Ken Ek, used with permission

of the form, and the augments were subsets of the images. Perhaps the parasitic aspect was that these forms seemed to destabilize the other. Although conceived as a single piece or unit, the experiences played out over time as the viewer absorbed them. And yet, the animals and insects which made up the AR experiences were consciously chosen because they occupy shared ecologies with humans. The import of the piece was to playfully connect the trajectory of the strangeness of a math object (or protocell) to an image disassociated with it, to an augment that was a representation of an animal or insect commensal with humans.

The relationships of all the things and subjects in the exhibition, not unlike *Clown-Town*, were ontographic, held together by a "list, a group of items loosely joined not by logic or power or use but by the gentle knot of the comma" (Bogost 2012). The extended mind and various memory codes may be a subset of this ontography. It fits with the stated intent of *Synthetic Cells* to be a pastorale that was located abstractly in a landscape. It seems in this time of so many layers of culture, economy, politics, and industry layered into nature, these strange sculptures were one way to approach it. They were tunnels through to nature, portals of sorts. The sculptures were created from two chambers that were in equilibrium, and the internal chamber had the feeling of a passage. Even so, the passage was blocked to maintain the double chamber stasis. Often, people expressed their desire to move through the passage and enter the sculpture.

This blockage contributed to the sense of the sculpture being an n-dimensional object. This is like a hypercube in which the various visualizations bring us tantalizingly close to the 4th dimension while it remains elusive, beyond our grasp. In an imaginative feat, the augment steps in to layer up the experience. It allows a leap to another thing, say an animated pig. It tunnels from some "out there" nature to some intimate experience where viewers can interact.

The augmented reality allowed another level of interaction in these sculptures. The app allowed viewers with finger gestures in the AR app to orbit, move, scale, and rotate the augments, create interactions with people within the picture frame, and play with one another. Depending on digital literacy, viewers had different levels of involvement with the tablet. This interactivity created social hierarchies and social roles. For example, technically savant people would easily take to the tablets and explore trial and error until they experienced the interactions completely. People more unsure of technology would watch this performance by interactors as if they were playing an instrument. Anyone playing with the tablet would often bring up their phone to photograph or video what they were seeing. Their accompanying friends often dart in and out of the scene, while the person working the tablet would form compositions then take photographs of the tableaux. People were drawn into the work in various ways, which created a diversity of experience. This was a feature of both *ClownTown* and *Synthetic Cells.*

Many of the themes of this paper may have been available to a sculptor before the information age; Donatello's David is one example. But what has changed in digital media? Are we experiencing new things never available before digital media, or are these experiences simply recapitulations of previous models?

As a member of the bridge generation, digital media is a profound change in how we know what we know. It is an essential investigative tool of knowledge and experience. Augmented reality is one of many innovations that will inevitably and irreversibly alter how we do what we do. Still, it was the tool that brought these tendencies to bear in me. It is an extension of network intelligence as it remakes the world by linking in real life (IRL) sites to diverse channels and experiences. These tools have affected the ability to imagine new relationships across multiple and various media. The provocative questions of this technique bring a deeper understanding of consciousness and extended cognition while updating memory codes.

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Part II
Augmented Reality Art and a Variety of Spaces

Chapter 6
Critical Interventions into Canonical Spaces: Augmented Reality at the 2011 Venice and Istanbul Biennials

Tamiko Thiel

6.1 Introduction

> In the twenty-first Century, Screens are no longer Borders. Cameras are no longer Memories. With AR the Virtual augments and enhances the Real, setting the Material World in a dialogue with Space and Time (Manifest.AR 2011).

In 2011, using the recently developed mobile technology of geolocated augmented reality (AR), the author was the primary organizer of two interventions into art biennials: in Venice together with Sander Veenhof and Mark Skwarek for our cyberartist group Manifest.AR (Manifest.AR Venice Biennale Intervention 2011) and in Istanbul in collaboration with the Istanbul design team (PATTU, Thiel T. Invisible Istanbul 2011). With geolocated AR, artists can place virtual computer graphic artworks at specific locations via the site's GPS coordinates. The artwork can then be viewed by anyone on site in the display of a smartphone or mobile-enabled tablet as an overlay on the live camera view, merged with the surroundings as if the artwork was there in real life.

Both Venice and Istanbul—bound together through centuries of often contentious history—are spectacular cityscapes and sites of former empire. They continue to fascinate not only for their spectacular settings and artifacts of their past glory, but also for their cultural presence in the globalized contemporary art world. The Venice Biennale, founded in 1895, is the world's oldest art biennial and arguably the city's main claim to relevance as a contemporary international destination. Istanbul, long in decline after the fall of the Ottoman Empire, has been reinvigorated in the past decades by Turkey's rising political and economic power. Its art biennial, founded in 1987, is a showcase for Istanbul's new position as a dynamic center of contemporary international culture.

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In both interventions, the curatorial questions were the same: How can we go beyond each city's glorious past to address its contemporary concerns and the reality of life in the city today? What role does the art biennial play in the political and cultural life of each city? Can we use the interventions to question the biennial system itself and the art world's use of that system to define and establish artistic value?

6.2 Challenging and Exploiting the Primacy of Site

The Manifest.AR artist group originally formed around an intervention into the United States' most iconic contemporary art space: the Museum of Modern Art in New York. Sander Veenhof and Mark Skwarek realized that the institutional walls of the white cube were no longer solid and organized a guerilla exhibit of augmented reality artworks inside the walls of MoMA.[1]

Since time immemorial location has been used to consecrate objects and people, the religious and power centers of the world maintain sacred spaces where only the chosen elect are allowed to enter. In the art world too, access to a location—a gallery, a museum, or other curatorially closed space—is tightly controlled to confer value and thus, via this exclusivity, to canonize the works shown there as "high art." What does it mean, however, to control physical space when in geolocated virtual space anyone can place whatever they want? (Aceti 2008). Augmented reality artists require no permission from government or artistic authorities to place their works at a specific site. They merely need know the GPS coordinates of the location—and unlike Street Art or other physical art interventions, the infiltrated institutions cannot remove the works, which remain on site as long as the artist wishes.

Technically, it is a trivial difference in GPS coordinates that moves a virtual object from a public space such as Central Park to the curatorially closed space inside the sacred walls of MoMA. As long as curators are gatekeepers for locations of high art, location still confers value—and placing AR works in such a location, even or especially if put there by the artists themselves in subversion of this control, endows the works with the aura of objects canonized by that location.

The epiphany of augmented reality, however, is that although the artworks are virtual, their presence at the site is "real": "having objective independent existence; not artificial, fraudulent, or illusory; occurring or existing in actuality" (Merriam-Webster online dictionary 2021)—and is reproducible by anyone who views the artwork at that site. In this "consensual hallucination" that was the dream of the early

[1] In October 2010 Sander Veenhof and Mark Skwarek organized the AR intervention "We AR in MoMA" (Veenhof 2010) for the Conflux Festival of Psychogeography (Conflux Festival 2010). Cyberpunk author Bruce Sterling blogged the intervention on WIRED (Sterling 2010), MoMA tweeted "Nice, looks like we're having an 'uninvited' AR exhibition tomorrow!" (Museum of Modern Art 2010), and later in an interview with the New York Times the director of digital media welcomed our engagement with her museum (Fidel 2010).

cyberpunk authors and virtual reality evangelists (Gibson 1984), augmented reality is redefining the barriers between what we consider "the real" and "the virtual."

Human culture has always been fascinated with the invisible, whether these were gods and supernatural spirits that could only be seen via divine grace or remote galaxies and tiny organisms that could only be seen with scientific instruments. Both individuals and entire societies invest sites with invisible layers of meaning as a part of personal and collective memory. Augmented reality art can now merge these invisible layers of memory and culture with the actual physical location. As with all site-specific artworks, viewers can also record their own personal encounters in screenshots, creating a dialog between the work, the site, and their own particular gaze.

In 2011, when we did these interventions, there were still voices that spoke of smartphones as elitist devices for the wealthy. Even then, however, our social lives had already moved into virtual space: We shared experiences by posting our photographs on the Internet and the small incidents and passing thoughts of our daily lives on Facebook and Twitter. At the time of writing of this chapter, less than 2 years later, it is clear that soon more people worldwide will be using mobile devices than PCs, and smartphones will become our main access platform to the digital commons (Standage 2012). What is the likelihood that kids in East Harlem[2] or people of all ages in Kenya (Talbot 2012) will view AR art on smartphones versus viewing art in galleries and museums?

6.3 Site as Canvas and Context

As interventionist art, augmented reality questions the possession and control of a physical space. As site-specific art, it also exploits and appropriates the physical space as its canvas and its context, as the virtual artworks are always seen merged with the live camera view of the surroundings. It enters into a dialog with the location visually to integrate it into the visual composition of the viewed augment, conceptually to trigger associations of memory and culture, but also physically as the viewer interacts bodily with the site. Usually, the viewer must search the surroundings to find the augment, like bird watchers scanning with binoculars, or must walk the site dodging real-world obstacles in order to experience the artwork in its totality. Thus, though the artwork is virtual, the viewer must engage physically with the site to experience it—an act which engages the kinesthetic sense of the viewer's body and thus situates the viewer and the act of viewing in the physical experience of that site.

Our interventions into art spaces and events are thus instigated by the visual, cultural, and physical facets of experience that the site provides for the artwork as

[2] In 2012 the author helped the Caribbean Cultural Center and African Diaspora Institute (CCCADI) to bring in a Rockefeller Cultural Innovation Grant to create "Mi Querido Barrio," an augmented reality tour of the history and art of East Harlem. As AR Artistic Director for the project the author is conducting AR workshops for artists in East Harlem (Rockefeller Foundation 2012; CCCADI 2012).

canvas and as context, with an express interest in the dialogs—in the art world and beyond—that engage the site. Many of our works dialog directly with the other "official" artworks at a venue and inevitably also with the theme and concept of the exhibition as defined by the curator. Many artists act on and react to contemporary events and discourses, of course, but the ability of augmented reality to geolocate artworks at the site of those discourses increases the potency of their visual argument.[3] In a time when many question the relevance of galleries, museums, and biennials as venues for art, we save the gated communities of the art world from irrelevance by bringing a new form of dialog into their institutions.

6.4 Manifest.AR Venice Biennale Intervention Themes and Concerns

At the 2011 Venice Biennale, we wished to reflect not on Venice's past glory, but on its current situation: wrestling with climate change, overrun by tourists and street vendors, fighting to keep its art biennial relevant in an era in which its national pavilions stand in direct contrast to the globalized, itinerant world of contemporary art, whose artists live and work in multiple systems of cultural reference. The national pavilions that dominate the Venice Biennale are a reflection of its origins at the end of the nineteenth century and the rise of the nation state with a presumed monolithic ethnic or cultural identity. At the very latest since the end of the Cold War, this concept has seemed antiquated, as Russia and Serbia disinherited their former comrades out of the USSR and Yugoslavian pavilions, and non-Western centers of international art such as China and the Middle East rise in prominence (Madra 2006).

Curator Bice Curiger's opening statement questioned this structure as well: "By adopting the title ILLUMInations the 54th International Art Exhibition of the Venice Biennale also aspires literally to shed light on the institution itself, drawing attention to dormant and unrecognized opportunities, as well as to conventions that need to be challenged … Far removed from culturally conservative constructs of 'nation,' art offers the potential to explore new forms of 'community' and negotiate differences and affinities that might serve as models for the future" (Curiger 2011). Curiger also posed five questions on identity to each of the artists officially included in the Biennale: "Where do you feel at home? Does the future speak English or another language? Is the artistic community a nation? How many nations do you feel inside yourself? If art was a nation what would be written in its constitution?"[4]

As an international artist collective that coalesced around challenging conventions of inclusion and participation, we saw this as a personal invitation to participate.

[3] The author's contribution to "We AR in MoMA" was a matrix of screaming faces titled "ARt Critic Face Matrix," a self-referential artwork that critiqued its own validity as an artwork, reflecting on the role of MoMA NY to define what did or did not constituted art (Thiel 2010).

[4] Although Curiger refers frequently to the "five questions," they are not to be found on the official Venice Biennale website. See for instance Flash Art (2011).

Sander hijacked Curiger's curatorial statement and the Venice Biennale Web site to create our Venice Manifesto, in which we proclaimed (see Fig. 6.1): As "one of the world's most important forums for the dissemination and 'illumination' about the current developments in international art," the 54th Biennial of Venice could not justify its reputation without an uninvited Manifest.AR infiltration. In order to "challenge the conventions through which contemporary art is viewed," we have constructed virtual AR pavilions directly among the 30-odd buildings of the lucky few within the Giardini. In accordance with the "ILLUMInations" theme and Bice Curiger's 5 questions, our uninvited participation will not be bound by nation state borders, by physical boundaries or by conventional art world structures. The AR pavilions at the 54th Biennial reflect on a rapidly expanding and developing new realm of augmented reality art that radically crosses dimensional, physical, and hierarchical boundaries (Manifest.AR Venice Intervention 2011a).

We wanted our intervention, however, to go beyond merely addressing Curiger's statement and also reflect on events in the wider world as they related specifically to the realities of Venice as a contemporary city. Questions about control of space went beyond the confines of the Giardini. So-called public art has always depended on permissions from the authorities to allow art to be placed in public view, and many a "public" space is actually closely controlled. We, therefore, placed artworks not only in the controlled curatorial space of the Venice Giardini, but also in the public space of Piazza San Marco, which has itself seen censorship of officially planned artworks (Magill 2007).

Four of us from Manifest.AR were able to actually go to Venice, and another five provided round-the-clock support from their various locations. Although AR

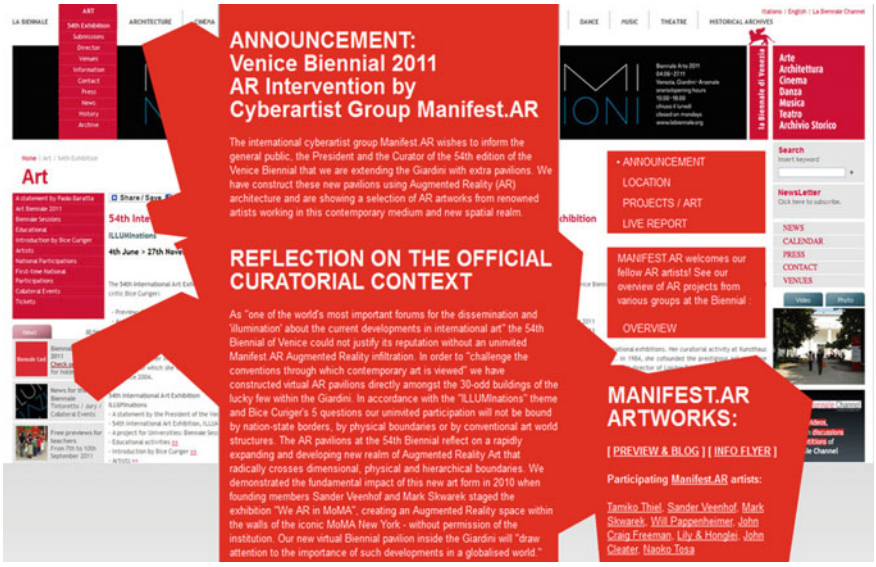

Fig. 6.1 Manifest.AR Venice Biennial intervention website

Fig. 6.2 In the Venice Giardini: John Craig Freeman, Sander Veenhof, Simona Lodi (Share Festival), and Will Pappenheimer and John Cleater in screens

artworks can be created and placed on site from anywhere in the world via the Internet, people are needed on site to document the artworks in screenshots and video recordings and—important for invisible artworks—to spread information on the intervention to the audience and engage them in viewing the artworks. We collaborated closely with another group intervention, The Invisible Pavilion. Organized by Share Festival director Simona Lodi and the artist group Les Liens Invisible, represented on site in Venice by Gionatan Quintini, we produced a common flyer and held joint AR tours in the Giardini and Piazza San Marco (see Figs. 6.2 and 6.3 and also Manifest.AR Venice Intervention 2011b).

6.5 Manifest.AR Artworks in the Venice Biennale Intervention

The author Tamiko Thiel's work, *Shades of Absence*, is a series of three "virtual pavilions" formed of terms of censorship and containing anonymized golden silhouettes of artists whose works have been censored. It posited a transnational community of censored artists in reply to Bice Curiger's questions: "Is the artistic community a nation? If art was a nation what would be written in its constitution?"

Shades of Absence: Outside Inside addressed the precarious status of artists threatened with arrest or physical violence (see Fig. 6.4). *Shades of Absence*: *Schlingensief Gilded* is a memorial to the controversial artist Christoph Schlingensief and was

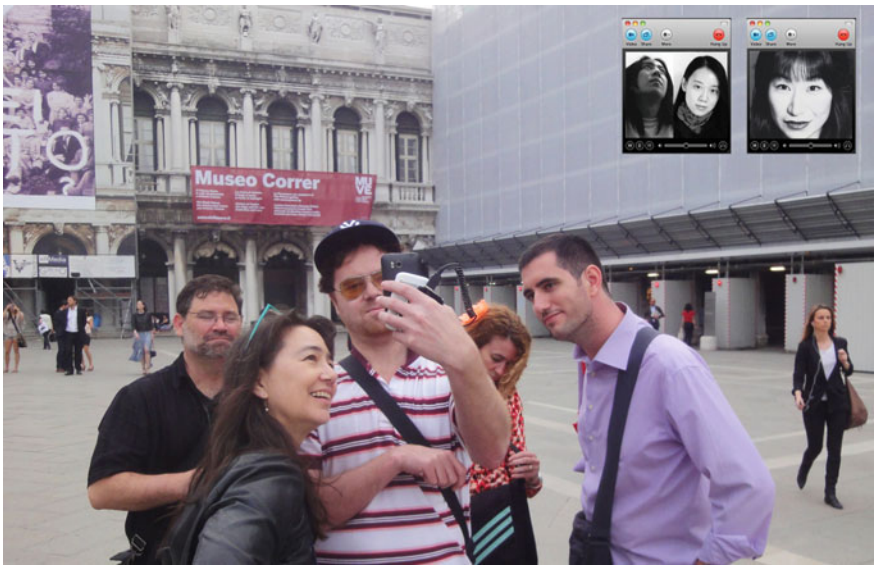

Fig. 6.3 In Piazza San Marco: John Craig Freeman, Tamiko Thiel, Mark Skwarek, Simona Lodi (Share Festival), Gionatan Quintini (Les Liens Invisible). In screens: Lily and HongLei, Naoko Tosa

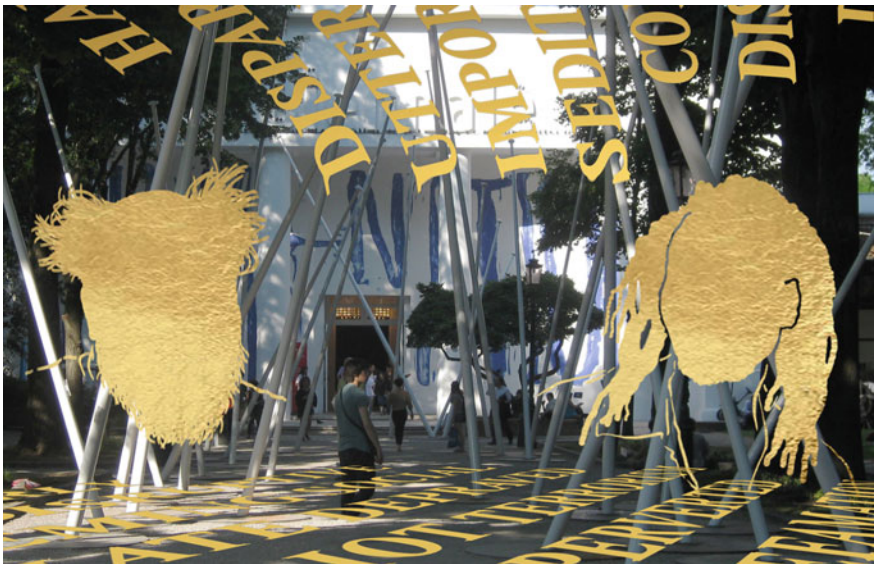

Fig. 6.4 *Shades of Absence: Outside Inside* by Tamiko Thiel (2011). Augmented reality, Venice Giardini. A memorial to artists threatened with arrest or physical violence

Fig. 6.5 *Shades of Absence: Schlingensief Gilded* by Tamiko Thiel (2011). Augmented reality, German Pavilion, Venice Giardini. A memorial to the artist Christoph Schlingensief, placed in his posthumous exhibit in the German Pavilion

placed directly in his posthumous exhibit in the German Pavilion (Fig. 6.5). *Shades of Absence*: *Public Voids* puts silhouettes of artists whose works in public places have been censored—including several by the Venice Biennale itself—in the Piazza San Marco (Fig. 6.6). In all works, touching the screen while viewing one of the artworks brings a link to a Web site with cases of these particular types of censorship (Thiel 2011b).

Sander Veenhof's work *Battling Pavilions* directly challenged the role of the curator, the exclusive nature of the Giardini, and the limited number of national pavilions allowed within its Sacred Grove. Users of this augmented reality app were given different curatorial powers depending on their physical location. If they were outside the Giardini, they could create a new virtual pavilion for any nation of their choice and place it in the Giardini (Fig. 6.7). If they were inside the Giardini, they took on the role of Biennale curator Bice Curiger defending her curatorial powers and could delete any of the upstart intruding pavilions (Figs. 6.8 and 6.9).

In a classic twist, Sander's intervention also became an official part of the Biennale: Hearing of his intervention, dropstuff.nl invited him to show his Battling Pavilions on their large screens in three locations around Venice (Veenhof 2011, see Fig. 6.7).

Mark Skwarek's *Island of Hope* addressed the physical situation of the islands of Venice, which since the founding of the city have been under perpetual threat of sinking into the lagoon. Skwarek posited new forces of continental uplift bringing hope of survival to Venice, the tectonic forces erupting out of the ground as fully formed baroque gardens in the Giardini (Fig. 6.10) and in Piazza San Marco

Fig. 6.6 *Shades of Absence: Public Voids* by Tamiko Thiel (2011). Augmented reality, Piazza San Marco, Venice. A memorial for artists whose works in public spaces have been censored

Fig. 6.7 *Battling Pavilions* by Sander Veenhof (2011). Augmented reality game. Scoreboard on dropstuff.nl screen during the Venice Biennale, displaying scoreboard of unauthorized virtual pavilions in the Giardini

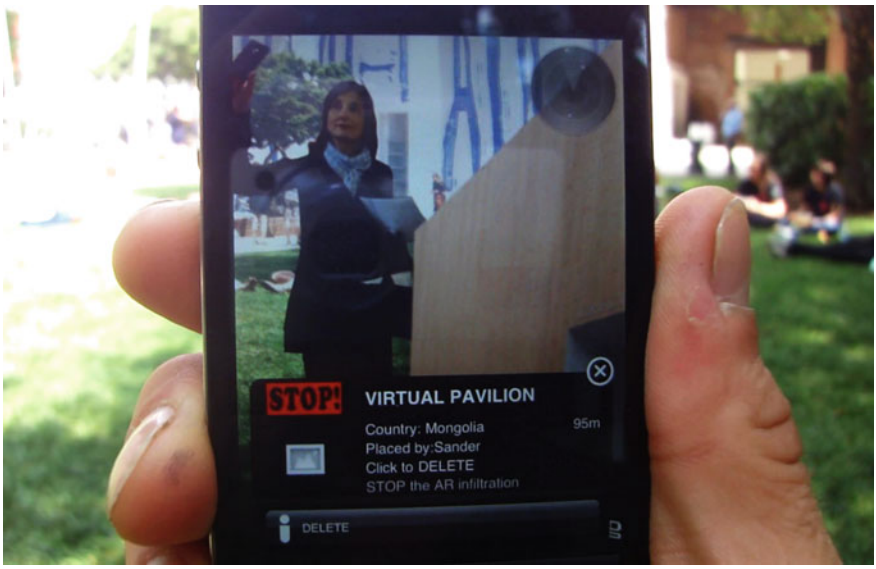

Fig. 6.8 *Battling Pavilions* by Sander Veenhof (2011). Augmented reality game. A visitor in the Giardini helping curator Bice Curiger to delete an unauthorized virtual pavilion

(Fig. 6.11). Besides bringing additional landmass, all-powerful goddesses on the islands incorporate objects of hope and tweets with the hash tag #hope, into the gardens in order to bring peoples' hopes and dreams to life (Skwarek 2011).

John Craig Freeman's *Water wARs: Squatters Pavilion* also focuses on the rising water levels in Venice, but with a dramatic difference. Water wARs is a virtual squatter's camp for refugees of water wars, one camp directly inside the protecting walls of the Giardini (Fig. 6.12) and another "public" camp in Piazza San Marco (Fig. 6.13).

In Venice, a city itself founded by refugees and threatened by constant flooding, Water wARs calls attention to the escalating global struggle for this basic human need, which made increasingly scarce not only by environmental damage but also through privatization of water supplies by multinational corporations. It questions the ability of sovereign nations to isolate themselves from the rest of the world, as worldwide ecological disasters drive people in desperation to violate the boundaries of the nation states in pursuit of sheer survival (Freeman 2011).

John Cleater's work *Sky Pavilions* provides help for Venice from an unexpected direction altogether—from above. Alien Sky Pavilions descend from outer space and take over Venice: The mothership hovers over Piazza San Marco emitting a mixture of nonsense and guidance to confuse and help tourists, natives, and art seekers (Fig. 6.14). In the Giardini, alien "Floaties" lie in wait, begging to be touched, and when activated by obliging visitors spin upward, carrying secret messages to the mother ship (Fig. 6.15).

Fig. 6.9 *Battling Pavilions* by Sander Veenhof (2011). Augmented reality game. The virtual version of curator Bice Curiger checks the Dutch Pavilion to make sure there are no unauthorized pavilions here

Sky Pavilions goes beyond the concept of the nation state, beyond the concerns of mere earthbound humanoids and reminds us that the last word in the control of space may not be ours to decide (Cleater 2011).

Lily and Honglei's work *The Crystal Coffin: Virtual China Pavilion* brings us squarely back to earth and confronts us with the realities of our shifting national structures. It is inspired by China's (current) Holy of Holies: Mao Zedong's crystal coffin, a petrified symbol of eternal Party rule. Placing the crystal coffin into the Giardini, the Sacred Grove of the Venice Biennale, both questions the traditional hierarchy of privilege among national pavilions in the Biennale and thematizes the rise of China as a vital—and financially important—center of contemporary art (see Fig. 6.16).

A second pavilion placed in the Piazza San Marco occupies the heart of this emblematic European city, whose native son Marco Polo "discovered" China for the West, and dominates it with this ultimate symbolic source of Chinese Party power (Fig. 6.17). At the same time, however, the reference to Mao's embalmed presence and the Party's current mandate of "traditional styles" for the pavilion building speaks

Fig. 6.10 *The Island of Hope* by Mark Skwarek (2011). Augmented reality. Seen in the Venice Giardini

Fig. 6.11 *The Island of Hope* by Mark Skwarek (2011). Augmented reality. Seen in the Piazza San Marco

of the ruling system's authoritarian tendencies that still inhibit the development of Chinese artists and intellectuals (Lily and Hong Lei 2011).

Will Pappenheimer/Virta-Flaneurazine's *Colony Illuminati* appropriated both the Biennale title "ILLUMInations" and the actual visual imagery of many artworks in

Fig. 6.12 *Water wARs, Giardini* by John Craig Freeman (2011). Location-based augmented reality. Pavilion for undocumented artists/squatters and water war refugees in front of the Giardini Central Pavilion

Fig. 6.13 *Water wARs, Piazza San Marco* by John Craig Freeman (2011). Augmented reality. Pavilion for undocumented artists/squatters and water war refugees in Piazza San Marco, Venice

Fig. 6.14 *Sky Pavilions* by John Cleater (2011). Augmented reality and audio. Alien Mothership Sky Pavilion floats over Piazza San Marco

the Biennale. This was a secret colony of virtual bufo toads that draws sustenance from high art: as a form of camouflage, their skin appropriates imagery from artworks around them as they multiply among the national pavilions in the Giardini (Fig. 6.18) and spread out into the city, seeking the outlying venues of the Venice Biennale (Fig. 6.19).

When touched on the smartphone screen, the toads release psychotropic drugs that trigger hallucinations in the viewer: a swirl of Internet information surrounding the Biennale and waves of Tintorettoesque ecstasy that Bice Curiger proclaimed to be the true essence of ILLUMInations (see Fig. 6.20 and Pappenheimer and Virta-Flaneurazine 2011).

Naoko Tosa's app *Historia* addressed Bice Curiger's question "Does the future speak English or another language?" and her view that "art offers the potential to explore new forms of 'community' and negotiate differences and affinities that might

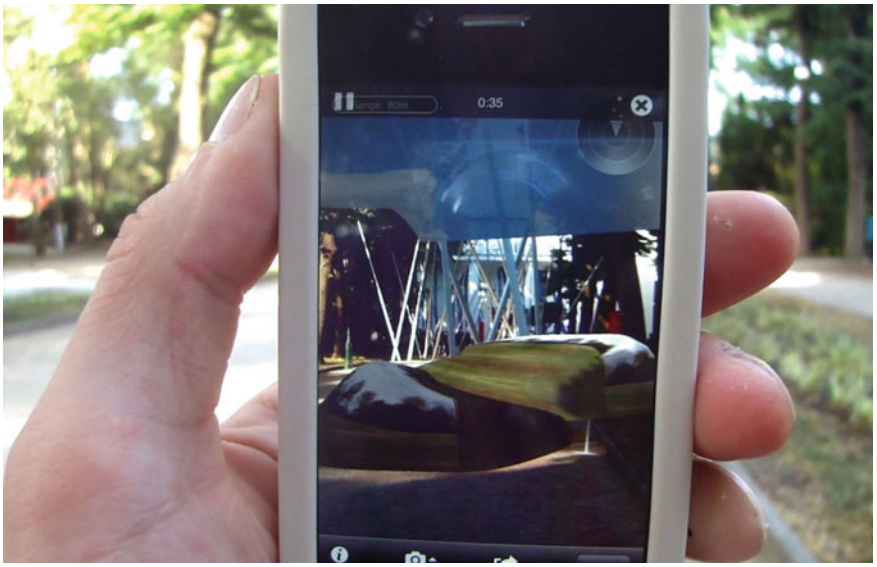

Fig. 6.15 *Sky Pavilions* by John Cleater (2011). Augmented reality and audio. Alien Sky Pavilion "floats" in the Giardini

Fig. 6.16 *The Crystal Coffin, Giardini* by Lily and Honglei (2011). Augmented reality. Artwork inspired by the crystal coffin in the Mausoleum of Mao Zedong in Tiananmen Square, seen here in front of the Giardini Central Pavilion

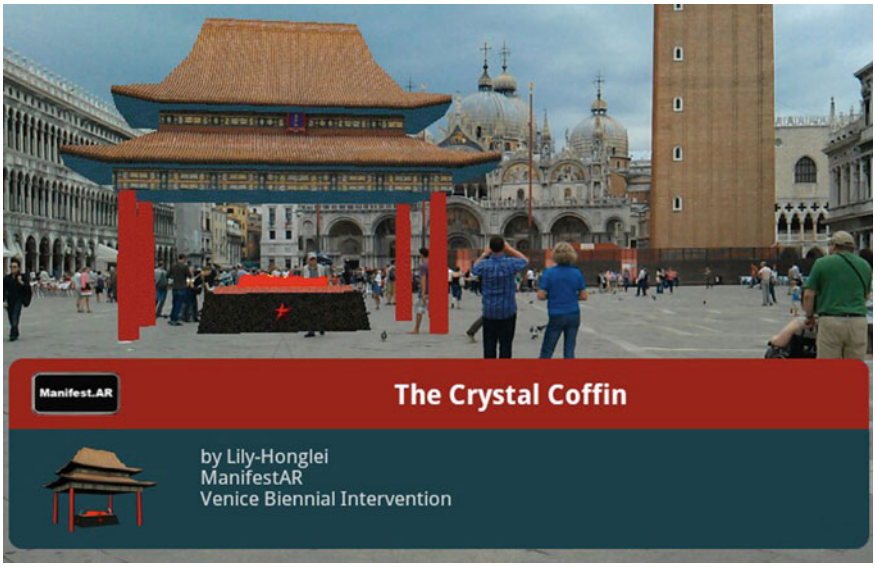

Fig. 6.17 *The Crystal Coffin, Piazza San Marco* by Lily and Honglei (2011). Augmented reality. Artwork inspired by the crystal coffin in the Mausoleum of Mao Zedong in Tiananmen Square, seen here in Piazza San Marco

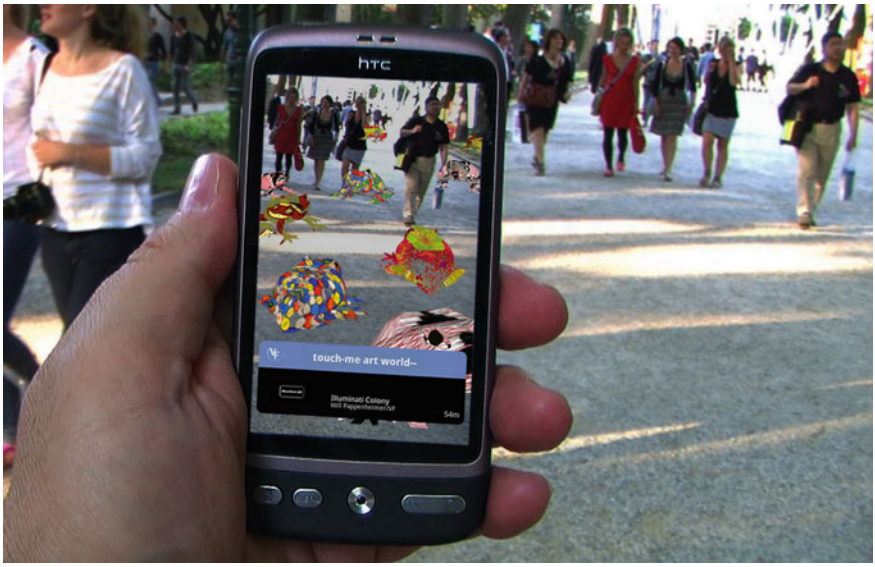

Fig. 6.18 *Colony Illuminati* by Will Pappenheimer/Virta-Flaneurazine (2011). Augmented reality. Colony group on Giardini main concourse

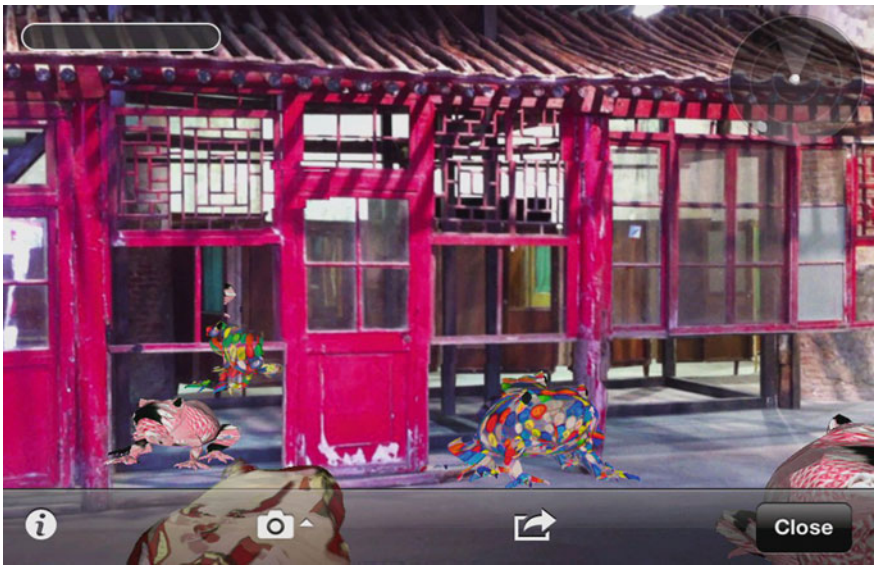

Fig. 6.19 *Colony Illuminati* by Will Pappenheimer/Virta-Flaneurazine (2011). Augmented reality. Songdongphilic toads in the Arsenale at the Song Dong parapavilion. Video still: Sander Veenhof, used with permission

serve as models for the future" (Tosa 2011). Historia appropriates iconic images from all nations and world cultures, from times both modern and ancient, and uses them to create a mental pavilion of re-constructed meaning. The interactive artwork allows visitors to choose icons, arrange them in a sequence—and then assign each icon a new meaning (Fig. 6.21).

Historia playfully examines the process by which artists appropriate and redefine existing cultural symbols to create their own individual language and distills it into a smartphone app. These messages, with their newly created, completely individual English "translations," appear as overlays in the Giardini and in Piazza San Marco, an international multicultural messaging mash-up for the transnational nation of art and art tourism (Tosa 2011, see Fig. 6.22).

The issues addressed by our works will remain relevant long after the 54th Biennale is over. Their virtual presence will remain too: As long as our servers run, the artworks of the Manifest.AR 2011 Venice Biennale Intervention will grace the city and the Giardini and can be seen by whomever looks for them (Manifest.AR Venice Biennale Intervention launch page 2011).

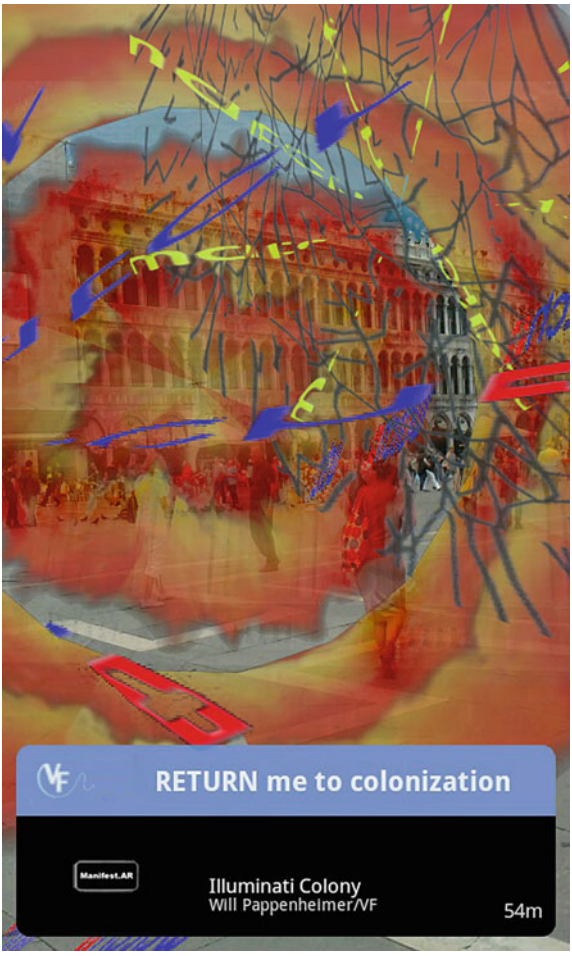

Fig. 6.20 *Colony Illuminati* by Will Pappenheimer/Virta-Flaneurazine (2011). Augmented reality. Visionary effects of touching Colony Illuminati toads at Piazza San Marco

6.6 Venice—Lewisburg—Istanbul

Even in the planning stages, our Venice Biennale intervention received the enthusiastic support of two curators deeply involved in interventionist art. Lanfranco Aceti, a practiced interventionist himself (Aceti 2008), helped us gain access to the Biennale and proposed a special issue of the Leonardo Electronic Almanac to address the questions raised by the intervention. (Aceti et al. 2013) Richard Rinehart invited us to intervene in his Samek Gallery in Lewisburg, Pennsylvania, on the same day that we opened at the Venice Biennale—and titled the exhibit "Not Here" to celebrate the fact that the artworks were present even though the gallery was closed for the summer (Rinehart 2011). Later that, fall Lanfranco, as director in Istanbul of both ISEA2011 and the Sabanci University Kasa Gallery, invited us to position our Venice artworks in the Kasa Gallery to create the show "Not There" (Aceti 2011; Manifest.AR blog

Fig. 6.21 *Historia* by Naoko Tosa (2011). Augmented reality. Users compose messages by appropriating historic icons floating in the space and assigning a new meaning to their message. Seen in front of the Giardini Central Pavilion

2011b) as part of the ISEA2011 exhibition UNCONTAINABLE, an official parallel program to the Istanbul Biennale.

For the city-state of Venice, the city of Constantinople/Istanbul was a constant, looming presence both culturally and politically. In the early centuries, Venice was part of the Byzantine Empire and owed allegiance—and taxes—to Constantinople, the great capital of eastern Christendom and seat of the Empire. In 1204, Venice's Doge Enrico Dandolo diverted the Fourth Crusade, bound ostensibly for the Holy Land, to Constantinople to sack the city and break its control over Venice. Weakened, Constantinople never fully recovered and finally fell to the Ottoman invaders in 1453. The lavish booty from Constantinople that adorns the Basilica San Marco in Venice turned, however, to poisoned fruit, as the renamed city rose to rival Venice in the Mediterranean as Istanbul, the great Muslim capital of the Ottoman Empire.

After World War I, the Ottoman Empire fell apart, surviving only as the much-reduced country of Turkey, and Istanbul fell into the melancholic slumber poetically described in Orhan Pamuk's novels. In the twenty-first century, however, with Turkey's rising political and economic power, Istanbul has once again become a thriving center of contemporary culture, and its former melancholy is not even a childhood memory for the current generation of young artists. Lanfranco's invitation to ISEA2011 and the Istanbul Biennale was an irresistible opportunity to experience a fascinating city through the concentrating prism of a contemporary art biennial.

Fig. 6.22 *Historia* by Naoko Tosa (2011). Augmented reality. Users compose messages by appropriating historic icons floating in the space and assigning a new meaning to their message. Seen in front of Cafe Florian, Piazza San Marco

6.7 "Invisible Istanbul": Istanbul Biennale 2011 AR Intervention

Through an artist residency at the Caravansarai artists' space in Istanbul (Caravansarai 2013), I had met Cem Kozar and Işıl Ünal, Istanbul architects and designers who run the design office PATTU (2013). They were interested in learning to use augmented reality technology and were deeply knowledgeable about the past and future urban development of the city, making for a fruitful collaboration on both sides. Together we created "Invisible Istanbul," a series of augmented reality works that make visible the unseen tensions within the city and its urban fabric (PATTU and Thiel 2011). As part of the ISEA2011 exhibition UNCONTAINABLE, it was also an official parallel program to the Istanbul Biennale.

The Istanbul Biennale is part and parcel of the urban development plan for the Beyoğlu district of Istanbul, and our artworks reflected on the Biennale both as a site and on its role—and the role of art exhibitions in general—in the official development plans of the city government. Some commented on the Biennale itself, others reflected on the urban space that the Biennale occupies, yet others drew a larger circle to place the Biennale area within the overall context of the Beyoğlu district.

The theme of the 2011 Istanbul Biennale also attracted my attention, as the curators Pedrosa and Hoffmann based their concept around the works of Félix González-Torr es and his method of creating politically charged artworks by investing small, banal objects from daily life with very personal conceptual significance. This method, and the curators' emphasis "on works that are both formally innovative and politically outspoken" (Istanbul Biennale 2011), spoke directly to how I want to work with augmented reality and presented an excellent point of departure for my own investigations.

Our intervention "Invisible Istanbul" consists of two parts, both of which used AR to place virtual artworks within the real physical space of Istanbul and the Biennale, creating surrealistic and poetic juxtapositions between real and virtual within the context of the hidden urban dynamics of Istanbul. Both begin with Tophane, the former military barracks and munitions factory where the main Biennale buildings are now located.

My works for "Invisible Istanbul," *Captured Images*, took as a point of departure the displays of military power during the Ottoman Empire on the site where now the Istanbul Biennale celebrates its power in the contemporary art world. This work series was inspired by photographs of Tophane taken at the end of the 19th for the last Sultan, Abdul Hamid II, showing displays of military might: soldiers lined up for drills; rows of cannon captured from enemy armies; shells of different caliber ordered by size; cannonballs stacked into pyramids. (U.S. Library of Congress 2013) In the 1950s, the barracks and factories were replaced with faceless warehouses and the rows of ordnance replaced with rows of goods. Today, these warehouses have been turned into exhibition spaces for art, and the rows of goods have made way for rows of artworks. My artworks continue this transformation, using objects from daily lives as their munitions and appropriating the main Biennale exhibition spaces as their venues, especially the group exhibitions "Untitled (Death by Gun)" and "Untitled (Passport)" (Thiel 2011a).

My works also reflect on tensions in Turkish civil society between tradition and modern, between military, political parties, opposition groups inside and outside of the political system, propaganda from all sides, the power of the journalist's pen(cil) to reveal and protest and uncover, but also of the political bureaucracy to define laws and jail sentences that are powerful weapons of intimidation. The Gezi Park protests of 2013 have only made the works more relevant.

In *Captured (cannon balls),* the ever-present Turkish nazar boncuğu glass amulets were stacked in piles inside the Biennale exhibit "Untitled (Death by Gun)." These amulets shatter when they avert the evil eye—what would it mean to use them as cannonballs (Fig. 6.23)?

Several works deal with the pencil as a symbolic weapon of rhetoric and propaganda for sides, whether journalist, blogger or bureaucrat. They can be fat as cannon as in *Captured (cannon)*, as stubby as projectiles as in *Captured (shells)*, which I placed in the exhibit "Untitled (Death by Gun)," or surround the viewer completely as in *Captured (stockade)*, placed in the exhibition "Untitled (Passport)" (see Fig. 6.24).

Of course, the pencil has long been replaced by the digital, so I created *Captured (for RSF_RWB)* and placed it also in the exhibit "Untitled (Passport)." The name

Fig. 6.23 *Captured (cannon balls)* by Tamiko Thiel (2011a). Augmented reality. Virtual nazar boncuğu glass amulets with animated eyeballs. Seen in the Istanbul Biennale exhibition "Untitled (Death by Gun)," with Kris Martin's *Obussen II*

Fig. 6.24 *Captured (stockade)* by Tamiko Thiel (2011a). Augmented reality. Virtual pencils surround the viewer. Seen here in the Istanbul Biennale exhibition "Untitled (Passport)"

Fig. 6.25 *Captured (for RSF_RWB)* by Tamiko Thiel (2011a). Augmented reality. The viewer is surrounded by censored tweets from Reporters Sans Frontières—Reporters Without Borders. Seen here in the Istanbul Biennale exhibition "Untitled (Passport)"

derives from the Twitter hash tag of Reporters Sans Frontières (Reporters Without Borders), and the artwork consists of RSF_RWB tweets in which I censored the substantive words and animated them to surround the viewer in a constant flashing stream (Fig. 6.25).

Finally, as a memorial to the assassinated Armenian-Turkish journalist Hrant Dink, I created *Captured (for Hrant)*. I took the last artifact we saw of him, his worn shoe soles sticking out from under the sheet covering his dead body in the middle of a main street in Istanbul. The shoe soles, in gold, wander around the viewer. This work I put against the stark geometric purity of Biennale architect Ryue Nishizawa's container walls (Fig. 6.26).

PATTU (Cem Kozar and Işıl Ünal) created *Invisible Istanbul: Urban Dynamics* as an augmented reality walking tour that departs from the Istanbul Biennale site in the Tophane neighborhood and winds through the nearby neighborhoods of Karaköy and Galata. Using their deep knowledge of both the city's past and the official development plans for the future, PATTU has used AR as a medium to map and visualize the dynamics of change that shape both the contemporary urban space and the lives of its inhabitants. The smartphone or iPad becomes a viewing instrument to bring into focus forces invisible to the naked or unknowing eye and make them visible in the public sphere.

For each site or "node" along the route, PATTU looked at the past, present, and future uses of the area. The AR artworks at each site envelope the viewer in a cloud of artifacts that reference the activities for which each area was, is, and will be used.

Fig. 6.26 *Captured (for Hrant)* by Tamiko Thiel (2011a). Augmented reality. The viewer is surrounded by the animated footsteps of murdered Armenian-Turkish journalist Hrant Dink. Seen here against the exhibition architecture done by Ryue Nishizawa for the Istanbul Biennale

This layer of symbolic information is visible as an overlay on the live camera view of the buildings and busy streets at each site, but is also complemented by links to a Web site with an historic photograph of each location and a textual description of the urban dynamic in play at each site (PATTU 2011). A small selection of nodes is described below as examples of the rich layers that can be experienced at each site.

Node 1: The Docks is in Tophane by the Antrepots used for the Istanbul Museum of Modern Art and the Biennale. Looking down at the ground, one sees cannon and other munitions, symbolizing the area's previous use as a military barracks and munitions factory. Looking straight ahead, one sees heavy gold painting frames and fragments of well-known modern paintings, symbolizing the area's current use for exhibitions of modern art. Looking up, one sees logos of multinational companies—McDonalds, Converse etc.—symbolizing the development plans that call for turning the whole area into a large terminal and shopping mall for cruise ships, where visitors can shop for the usual international brands without having to deal with the city or culture of Istanbul (Fig. 6.27).

In *Node 4: The Minorities of Istanbul,* the past shows a rich diversity of shop signs in what was Istanbul's most multicultural neighborhood—destroyed by the Pogrom of September 6th/7th, 1955, symbolized by the cloths of the textile merchants that littered the streets for days afterward. Currently slumbering in urban decline, the future is to be dominated by hotels and shopping malls (Fig. 6.28).

In *Node 5: Brothels,* both the past and the present are dominated by symbols of brothels, the single surviving one being tucked away on the picturesque side

Fig. 6.27 *Invisible Istanbul: Urban Dynamics—Node1* by PATTU (Cem Kozar/Işıl Ünal) 2011. Augmented reality. The Docks: From munitions factory to art exhibitions to shopping mall

street visible in the screenshot. A look skywards shows that this area is slated for development of a park and high-end hotels (Fig. 6.29).

Standing on Voyvoda or Bank Street to view *Node 8: Museum Inflation,* one still sees trucks loading and unloading sacks of money at the same banks that dominated this area in the past. The smaller buildings are now dominated by electronic shops selling everything from lamps to satellite dishes, and the banks themselves are being turned into art museums. Looking up, one sees symbols for art and for the hotels that are also planned for this area in the future (Fig. 6.30).

Fig. 6.28 *Invisible Istanbul: Urban Dynamics—Node 4* by PATTU (Cem Kozar/Işıl Ünal) 2011. Augmented reality. The Minorities of Istanbul. From cosmopolitan Galata through the Pogrom of Sept. 6th/7th to hotels and shopping malls

This is just a small sample of the sites covered by Invisible Istanbul: Urban Dynamics. As diverse as was the past and present in these neighborhoods, the future repeats itself in alarming monotony: multinational brands, upscale hotels—according to the official development plans for the city of Istanbul. The tour should be a requirement for everybody interested in the fate of this fascinating and dynamic city.

Fig. 6.29 *Invisible Istanbul: Urban Dynamics—Node 5* by PATTU (Cem Kozar/Işıl Ünal) 2011. Augmented reality. Brothels: From many brothels to one brothel to a park and hotels

6.8 Conclusions

The Venice and Istanbul Biennales of 2011, and the questions raised by their curators, framed questions that we took far beyond the curators' original intent in order to also address issues of curatorial control of selection and space, inclusivity and exclusivity, and the autonomy of the artist in the light of the possibilities of the new medium of geolocative augmented reality.

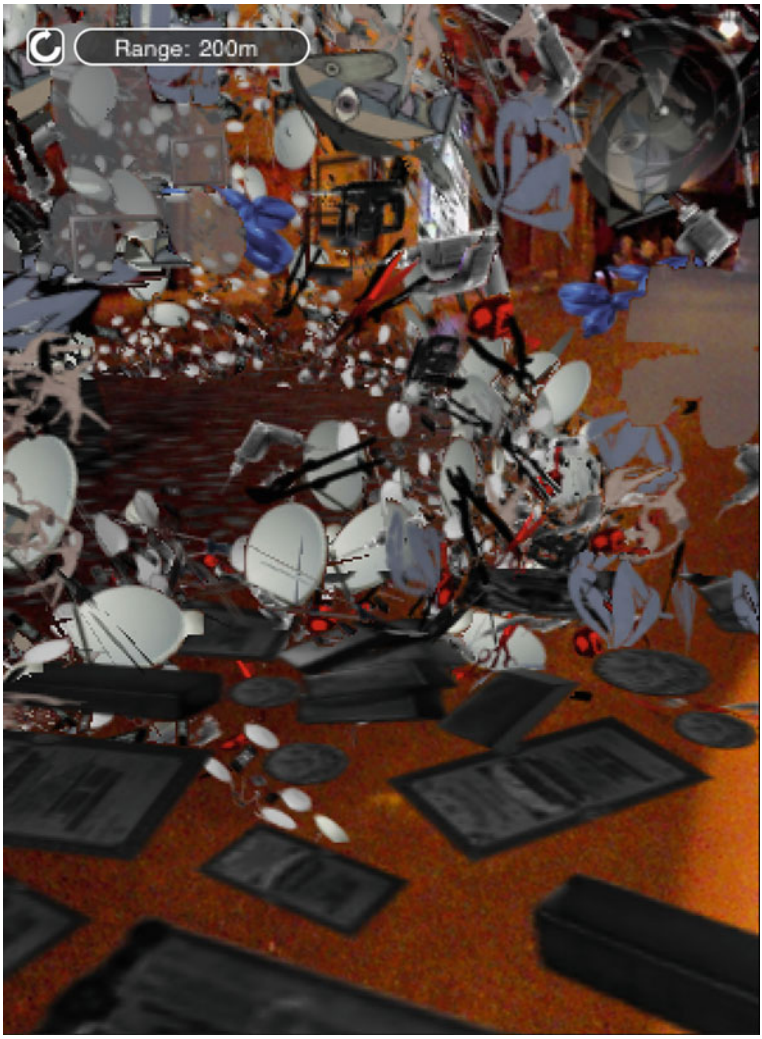

Fig. 6.30 *Invisible Istanbul: Urban Dynamics—Node 8* by PATTU (Cem Kozar/Işıl Ünal) 2011. Augmented reality. Node 8: Museum Inflation. From banks to electronic shops to art museums and hotels

Our works at the Venice and Istanbul Biennales went, however, beyond a reflexive focus on art world dilemmas to address contemporary issues in the cities in which the biennials took place. Venice and Istanbul are two of the world's most compelling cities, overlaid with complex and often conflicting webs of history and memory, fantasy, and desire. The new technology of mobile augmented reality allowed us to dialog with these sites in a new manner, transforming specific sites into both the context and the canvas for our works of art.

I end with a quotation from Bice Curiger's curatorial text for the Venice Biennale:

> ILLUMInations presents contemporary art characterized by gestures that explore notions of the collective, yet also speak of fragmentary identity, of temporary alliances, and objects inscribed with transience. If the communicative aspect is crucial to the ideas underlying ILLUMInations, it is demonstrated in art that often declares and seeks closeness to the vibrancy of life. This is more important now than ever before, in an age when our sense of reality is profoundly challenged by virtual and simulated worlds. This Biennale is also about believing in art and its potential (Curiger 2011).

I could not agree more. Perhaps, in ways that Bice Curiger did not anticipate.

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Chapter 7
Merging Spaces: Augmented Reality, Temporary Public Art, and the Reinvention of Site

Rachel E. Clarke

7.1 Introduction

Temporary public art is one of the most exciting forms to emerge in late twentieth century art. Sited outside of the gallery or museum walls, temporary public artwork is encountered where art is not normally located, and where an audience may come into contact with it as part of their everyday experience. Augmented reality (AR) art makes possible the integration of virtual objects into the real world as a seamless collage, and in this essay, it will be explored as an emerging form of temporary public art. That said, the constant evolution of AR and mobile technologies in the last decade has led to much richer augmented reality experiences, so that AR now offers a radical expansion of the very definition and practice of temporary public art for the twenty-first century.

The essay will begin with a definition and discussion of some of the artists and projects that defined temporary public art as a practice prior to the emergence of AR technology. The author will discuss an AR project from the mid-2010s that was modeled on these practices and then will discuss recent works where AR can be seen as a reinvention of site-specific public art.

7.2 Temporary Public Art

The impermanence of temporary public art makes possible the insertion of unfamiliar, challenging, or timely content into the artwork, and into its relationship to a site. In temporary work, artists have more latitude to purposefully intervene into a space; if the work is controversial, the fact that it will disappear soon enough means that

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it will not risk causing ongoing offense to the public. The experience of having an unexpected encounter with art in a public space was described in 2002 by Rupert Christianson in *The Daily Telegraph* (referencing the work of Artangel) as "art that operates by ambush, rather than asking you to pay up before you see it" (Rupert 2002). Unlike the experience of intentionally visiting an art museum, happening upon an artwork in an unexpected location can offer a more direct, arresting encounter with the work.

The notion of temporariness lends a great deal of freedom to work located in public spaces. The trailblazers for temporary public art are Christo and Jeanne-Claude, who—working from the 70 s onwards—became famous for transforming both urban and natural landscapes through large-scale wrapping and covering projects.[1] These included wrappings of buildings and bridges and covering natural landscape features. Their projects were made possible through years of behind-the-scenes planning and preparation, involving extensive research into a location and its use; debate in public hearings; community engagement; political negotiation; navigation through myriad bureaucratic channels, and engineering feats. In the realization of the work, materials such as woven nylon fabric and recyclable polypropylene were used as a covering material, overlaying the original details of a given site like a second skin, to create a temporary affective disruption that was physical, social, and perceptual.[2] Examples include *Running Fence*, 1972–76 in Sonoma and Marin Counties, California and *L'Arc de Triomphe, Wrapped*, 1961–2021 in Paris (completed posthumously). See Fig. 7.1.

The artists spoke of the aesthetic qualities of their projects, such as the sensory effects of light and movement over the massive fabric surfaces, as Christo said (referring to *Running Fence*) "…in the end I think it is beautiful…some will think it's atrocious…the fabric…is the conductor of light, and…in sunset there will be an incredible ribbon of light traversing through all these fences." (Maysles et al. 1977). However, each project was an intervention and often a contentious one. Given the monumental scale of the transformations, the normal function of a chosen site was temporarily disrupted, and this interruption drew attention to the infrastructures and bureaucracies set in place to maintain those norms. The landscape-based projects also highlighted systems of land ownership and use, bringing up environmental questions. In a heated public hearing for *Running Fence*, Christo said:

> The work is not only the fabric, the steel posts and the fence. The art project is right now, here. Everybody here is part of my work...20th-century art is not a single, individualistic experience. It is the very deep political, social, economical experience I live right now, with everybody here...we have emotion and fear, but that… is a part of my project (Maysles et al.1977).

Christo and Jeanne-Claude's wrappings were actually an uncovering and unmasking of underlying systems of power, manifesting as human possibility emerging out of seeming impossibility.

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[1] Wikipedia, Christo and Jeanne-Claude https://en.wikipedia.org/wiki/Christo_and_Jeanne-Claude, accessed 22 Jan 2021.

[2] Website, Christo and Jeanne-Claude https://christojeanneclaude.net/, accessed 24 Jan 2022.

Fig. 7.1 Christo and Jeanne-Claude, *L'Arc de Triomphe, Wrapped*, 1961 - 2021, 2021, site-specific art, photo: Michael Schawann, via Wikimedia Commons

7.3 Site-Specificity

Site-specific art was a term coined by artists in the 1970s (including Robert Irwin) and validated by Lucy Lippard (1997) and other critics,[3] to refer to art that is made as an intervention into a specific location, environment, or landscape—work envisioned as non-commercial, (typically) anti-monumental, and often temporary. The work depends on the site, and the site is transformed by the work; it is a relationship between the site, the work, and the viewer. Over the last 35 years, the projects of the UK temporary public art commissioning agency, Artangel have set the standard for how this type of work can become a vital component of the public landscape. On Antangel's website it claims: "The art we produce boldly responds to the environment…reveal[ing] a different side to the world we live in" (Artangel 2021).

In 2008, Roger Hiorns created *Seizure* (see Fig. 7.17) as an Artangel project in a disused apartment of a council estate in Elephant and Castle, in the London Borough of Southwark. Hiorns filled the rooms with copper sulfate and water, allowing a chemical reaction to occur. After a cooling period, the liquid was removed revealing that the apartment walls, floor, and ceiling were completely covered in blue crystal formations—sharp glassy protuberances that transformed the space into an other-worldly grotto. The installation entirely contrasted with the rationalist modern architecture surrounding it, creating a mysterious inner world that while inviting, was also alien and inhuman. Charlesworth wrote: "Here, in this flat that has become not a cave but a crystal geode, it is as if the living space of modern humanity is being reclaimed by the inorganic"[4] (Charlesworth 2008). The piece was well received by the public, while another famous example of work commissioned by Artangel, *House* (1993) (Fig. 7.2) by Rachel Whiteread was more controversial.

House was completed on-site in the last home of a condemned neighborhood in North-East London. The owner lost the battle to keep his home, and Whiteread went into the abandoned property and cast the walls, ceilings, and floors, capturing impressions of the intimate details of the interior space. She then removed the brick exterior of the house to reveal the concrete impression of the cast interior; a white, empty shell. The piece elicited a powerful response from the public for its stark beauty and for the raw exposure of the familiar domestic inside space, transformed through inversion into a metaphor for loss and absence. While people flocked to see it, it was at the same time highly controversial; its funding and purpose were questioned when many were experiencing the effects of the public housing crisis during the Thatcher era. A battle between the art world and the local council ensued; one council member described *House* as an "excrescence" (Cohen 2018). *House* was finally demolished by the local council after 80 days, amidst a public outcry to let it remain standing. The project demonstrated the power of site-specific art to ignite imagination and public debate. As Whiteread said in 2007, "I was used to making

[3] Lippard, Lucy (1997) Six Years: Dematerialization of the Art Object from 1966 to 1972, University of California Press, Berkeley

[4] Skwarek, Mark (2018) "Augmented Reality Activism" In: Geroimenko, V (Ed) Augmented Reality Art, Springer, 2018.

Fig. 7.2 Rachel Whiteread, *House*, 1993, site-specific art, photo: Simon Edney, https://www.researchgate.net/, via Wikimedia Commons

work in the studio. With this, everything was immediately very public, and people had their say at once…There was nothing in the art world that had had that level of publicity before" (Higgins 2007). The work exemplifies aspects of site-specific and temporary art—it originated out of the physical location, and addressed timely issues that were of immediate relevance to its audience.

Works by Christo and Jeanne-Claude, Hiorns, and Whiteread stand out in the field; their visual presence in the natural/urban landscape was arresting, and they operated as complex, multilayered relationships of work, site, and viewer. Their temporary nature added to the sense of momentousness, something uncommon that needed to be seen before it disappeared forever. Yet the works did not yield immediate and straightforward readings—they were of their moment, but they also opened up dialogues beyond their own realization that gave them enduring relevance. They were personal and poetic, as well as political and challenging. As the author began working in augmented reality, she wanted to channel this kind of complexity for virtual works in public spaces.

7.4 Augmented Reality as Temporary, Site-Specific Public Art

With this in mind, the author spearheaded, co-organized, and co-curated *Broadway Augmented*, an augmented reality virtual public art project in the Broadway district in Sacramento, California, in 2014. It was one of the first augmented reality projects in the USA that was specifically conceived of as temporary public art (in the same vein as Artangel's projects) funded by a public art commissioning agency (Sacramento Metropolitan Art Commission—SMAC) and subjected to the same panel review process that any public art would go through before it appeared in a public space. Additional support for this project came from the National Endowment for the Arts, The Greater Broadway Partnership, and California State University, Sacramento. The commissioning agency was interested in the possibility of integrating augmented reality into the public art selection process. Since one of the works might have been realized in a physical form, augmented reality was seen as a way to involve the public by virtually sharing potential works in their locations to the public. The idea of using AR for prototyping was another experimental aspect of the project; however, the virtual installations created on Broadway were already public sculptures (in a virtual form) and augmented reality made it possible for the artists to create work beyond the confines of physical realization, so the project surpassed this expectation.

7.5 Precursors

The project was innovative in a number of ways. Previous notable projects in augmented reality—such as those by the artist group Manifest.ar (founded in 2011)—were oriented toward digital activism, with artists provocatively siting AR works in charged public locations without seeking permission. The manifesto on the Manifest.ar website states:

> With AR we install, revise, permeate, simulate, expose, decorate, crack, infest and unmask Public Institutions, Identities and Objects previously held by Elite Purveyors of Public and Artistic Policy in the so-called Physical Real (Manifest.ar 2011)

An early example of an interventionist project, arOCCUPYWALLSTREET (arOWS) happened in November 2011 as part of the Occupy Wall Street mass protest movement[5]; (arOWS) artists included Mark Skwarek (organizer) Diane Ludin, Elvira Kalviste, Geoffrey Alan Rhodes, John Cleater, John Craig Freeman, Patrick Lichty, Sander Veenhof, Sarah Schoemann, Scott Kildall, Tamiko Thiel, The four Gentlemen, The Secret Studio, Todd Margolis, Warren Armstrong, and Will Pappenhiemer. The artists used image recognition to attach augmented reality works to the New York Stock Exchange and Wall Street. Since the area was inaccessible to the general public

[5] Skwarek, Mark (2018) "Augmented Reality Activism" In: Geroimenko, V (Ed) Augmented Reality Art, Springer, 2018.

at that time, it would not have been possible to display physical artwork there, so using AR was the only viable modality for protest art. The work in (arOWS) had sense of immediacy and was focused on visual collages in which protest-themed images, models, and animations were superimposed over the urban environment. The work played an important role in expressing public outrage at the banking industry; an animated slot machine overlaid onto the NYSE building was a particularly iconic example of the powerful work that came from this project, symbolically representing the American economy as an unequal gamble.

7.6 Virtually Installed Public Art

Rather than existing as an unpermitted intervention, *Broadway Augmented* was conceived of as being centered around creating varied, site-specific public art works—as virtual installations rather than physical ones.[6] The website tagline was: "Public art, virtually installed, superimposed on the real world through your phone" (Broadway Augmented 2014). To experience the work on Broadway, the viewer would download the Broadway Augmented app onto their mobile device. Once launched, the app would enable them to see the artist's work on the screen of their device, superimposed over a specific location in the street (Figs. 7.3 and 7.4). This made augmented reality ideal as a form of site-specific public art in the street; and the Greater Broadway Partnership (a non-profit business-friendly organization dedicated to promoting the district) as co-sponsors welcomed the opportunity for a project that would draw attention to Broadway's unique character and attract pedestrian traffic.

"I would be thrilled if people came down and were engaged in looking at the built world on Broadway," said Shelly Willis, director of the Sacramento Metropolitan Arts Commission. "That is the point, get people down to Broadway and get people thinking about the built environment." Viewers would wander the entire district while searching for the different locations of the virtual sculptures. As the late Teresa Rocha, then director of the Broadway Partnership, said "What is happening downtown is real exciting, but one of the strengths of Sacramento is its neighborhoods… It's not an either/or" (Fletcher 2014).

The website provided the following information (Broadway Augmented 2014):

- Go to Broadway (anywhere between 21st Street and the Old City Cemetery), during daylight hours
- Download and launch the augmented reality (AR) application (app) onto your smart phone. Note: The app will not be available until opening day: September 13, 2014.

[6] Broadway Augmented team consisted of Shelly Willis, Project Director/Curator, Rachel Clarke Technical Director/Curator/Artist; Project Administrators: Teresa Rocha, Broadway Partnership Executive Director/Site Director; Gwen Amos, Creative Director (Graphic Design); Geoffrey Alan Rhodes Augmented Reality Director; Alexander Nichols Project Coordinator; Allie Gerriets Lead Designer, Paul Kreizenbeck, Web Designer, Mario Sotelo lead modeler, and the 3D Modeling Team.

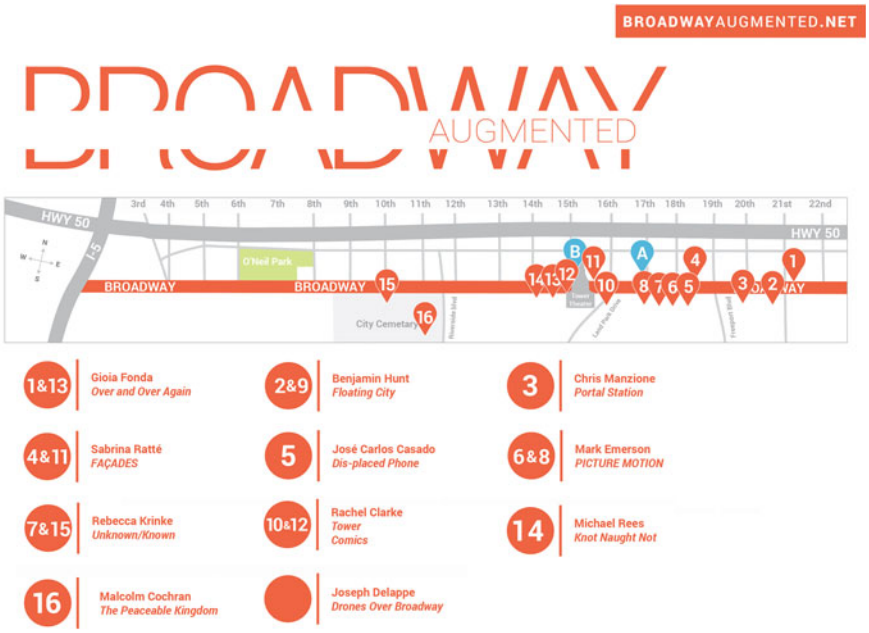

Fig. 7.3 Ali Gerriets and Paul Kreizenbeck (with Gwen Amos), *Broadway Augmented Map*, 2014

Fig. 7.4 Ali Gerriets and Paul Kreizenbeck (with Gwen Amos), *Broadway Augmented* publicity 2014

- Follow the map within the app. The map illustrates where the virtual artworks are located.
- Aim your device's camera at the location shown on the map to view artwork in real-time on your phone.
- Your tablet or wireless device does not have to be connected to a wireless network to view the project.

The intention was to use augmented reality to create new relationships between the street as it currently existed and the virtual overlays—contemporary interpretations of Broadway by artists reimagining each location. The unique nature of augmented reality objects is that they exist on the screens of mobile devices, as virtual models that attach to specific objects or places in the physical world, creating a momentary union between different realms. As such, they are neither physical nor entirely virtual (such as what one would experience when using a headset) instead they have a hybrid existence. Reimagining a location with an augment is an embodied experience for the viewer—they choose to go to the physical space, interact with their device to download and open an app, then relate the augmented screen image on their device to their physical surroundings. Looking through their phone, they move around to encounter the merging of virtual and physical elements. In the process, a new reality that is a synthesis of real and imagined content is manifested. There are so many different ways that an augment—essentially an apparition—can insert its presence into physical space, and the project gave artists (many with fresh eyes on this technology) the latitude to explore a location with this medium in their own terms.

Eleven local, regional, and national artists were invited to participate: Gioia Fonda, Malcolm Cochran, Michael Rees, Chris Manzione, Joseph Delappe, Rebecca Krinke, Sabrina Ratte, Ben Hunt, Jose Carlos Casado, Mark Emerson, and the author (who participated as an artist, co-curator and co-organizer of Broadway Augmented). See Fig. 7.5. The app was developed by Geoffrey Allan Rhodes (technical director) using the Unity game engine and Vuforia augmented reality engine, and its interface was designed by CSUS graphic design students. While initial AR tests on the street used geo-location to site the work (placing the work by attaching GPS coordinates to the models), the positioning was not sufficiently accurate in 2014 to assign site-specific works to exact locations using this technique. Image targeting was selected as the best option, using street features such as signage and architectural details for triggering accurate model placement. Image targets also created a very immediate relationship between physical features of the street and the virtual objects created by the artists.

Some of the artists had worked extensively with AR before, while others had not. Those who had not were invited to work with paid student interns from California State University, Sacramento, who could prepare their 3D models using Autodesk Maya.[7] This made it possible for artists in a wider range of practices (painting, sculpture, public art, installation) to participate, alongside new media artists familiar with the medium:

> A new artistic material—intervals of real and virtual—was provided to a set of artists that included not just media artists, but painters, sculptors, and others as well. This combination of traditional public art methods of site-specific commissions and a new medium was the original promise of *Broadway Augmented* (Rhodes 2014).

[7] Broadway Augmented modeling team consisted of California State University, Sacramento students Mario Sotelo (lead modeler), Bryan Maretti, Sophia Scalice, Melissa Shaw and Cody Drury.

Fig. 7.5 *Broadway Augmented* (in-app screenshots) 2014, photo: Rachel Clarke. Top row (left to right): Ben Hunt, *Floating Cities,* Sabrina Ratte, *Facades;* Middle row (left to right): Rebecca Krinke *Unknown,* Gioia Fonda *Over and Over Again*, Mark Emerson, *Picture Motio*n, Michael Rees *Knot Naught Not;* Bottom row (left to right): Malcolm Cochran *The Peaceable Kingdom,* Chris Manzione *Portal Station*, Rachel Clarke *Tower.*

The union of digital and physical realms that happens with augmented reality is made possible through the creation of virtual objects that convince the viewer of their reality, even though they cannot, and do not actually exist. Working with experienced modelers meant there could be a strong emphasis on realizing detailed, fully three-dimensional virtual sculptures with textures, normal maps, and baked-in lighting for a high level of realism. Using high-quality models and as much polygon and texture detail as were possible in 2014 allowed for the line between virtual and physical reality to be blurred when encountering the work.

7.7 History and Context

Each artist visited Sacramento to conduct research, and to spend time in the Broadway district to determine a location for their piece; the invited artists were encouraged to consider site-specificity and the temporal nature of the project. The fact that the project was temporary also meant that it was feasible to deal with current issues or larger contemporary themes, and some chose to do this. The street itself provided

Fig. 7.6 Sacramento historic city cemetery (California Historic Landmark) 1866, photo: Lawrence and Houseworth, Public domain, via Wikimedia Commons

a lot of potentially rich content.[8,9] Formerly named Y Street, Broadway was the southernmost street in the original 1848 Sacramento city grid, running east to west, and located south of Midtown, the city center, and Old Sacramento. Among others, many Chinese immigrants settled in the neighborhood, and as a result, the Broadway district houses a Chinese Association, a traditional Buddhist temple, and numerous Chinese businesses, such as grocery stores and restaurants. The Historic City Cemetery (Fig. 7.6), founded in 1849, is located in the western portion of the corridor. The Tower Theater, with distinctive art-deco architecture, opened in 1938, prompting the city to rename the street Broadway. Broadway thrived as a business corridor, but the construction of the W-X freeway in the 1960s isolated it from the city center. While it

[8] Wikipedia, Sacramento, https://en.wikipedia.org/wiki/Sacramento,_California, accessed 23 Jan 2021.

[9] Greater Broadway Partnership "The Greater Broadway Area - History," https://www.greaterbroadwaydistrict.com/the-greater-broadway-area-history, accessed 23 Jan 2021.

Fig. 7.7 Joseph Delappe, *Drones Over Broadway*, and Jose Carlos Casado, *Dis-placed Phone* (in-app screenshot) 2014, Augmented Reality, photo: Geoffrey Alan Rhodes, used with permission

still houses a diverse collection of businesses and ethnic restaurants, in recent years, the district has been in decline, regarded as an access route rather than a destination. Bringing artists to the neighborhood to reimagine it was seen as a great way to bring visibility and a fresh perspective to Broadway and its unique culture and history.

7.8 Drones Over Broadway

The artists were given the freedom to consider their work as a potential prototype for a physical piece, or to work without consideration of physical reality. Most of the artists decided to entirely embrace augmented reality, creating works that could never exist in the physical world, exploiting the possibilities that only a virtual artwork would afford them. Joseph Delappe's piece, *Drones Over Broadway* (Fig. 7.7), was a virtual drone that could be seen hovering above the viewer in various artwork locations, a reminder that the USA has performed unmanned aerial vehicle strikes in Iraq, Yemen, Somalia, Libya, Afghanistan, and Pakistan, resulting in the highly controversial deaths of unarmed, non-combatant citizens.[10] Delappe's intention with

[10] Wikipedia, Drone Strikes, https://en.wikipedia.org/wiki/Drone_strike, accessed 24 Jan 2021.

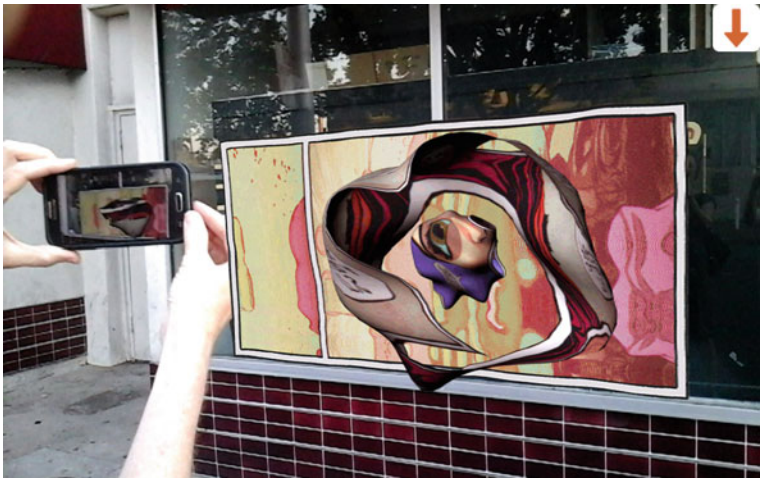

Fig. 7.8 Rachel Clarke, *Comics* (in-app screenshot) 2014, Augmented Reality, photo: Rachel Clarke

this ever-present drone was to "create an unexpected experience in a typical domestic context by simulating what it might be like to live in a warzone –creating a brief moment for Americans to contemplate just what it might be like to live under droned skies" (Delappe 2014). Using the sky as the location expanded the project beyond the street level and reminded the viewer of larger issues in the contemporary political landscape.

7.9 Comics

Some of the works were attached to local stores; chosen for their idiosyncratic character or significance, or to expand on the larger cultural themes that they foregrounded for the artists. The author created a work for the window of Broadway Comics (Fig. 7.8). After visiting the almost hidden store and discovering a vibrant subculture of Marvel and DC enthusiasts, she wanted to reveal on the outside what was hidden within. The piece riffs on comic-book imagery and its superhero universe, while also questioning the gender stereotyping that has characterized this American pop-culture form, with male superheroes forming the dominant narratives, and females relegated to minor roles and excessively sexualized portrayals. Positive female representations have been emerging since the 2000s, de-emphasizing sexuality and placing women in primary superhero roles, but still in Hollywood films, comics, and video games women are overly sexualized and underrepresented as leaders.[11] The author's piece,

[11] Katherine J. Murphy "Analyzing Female Gender Roles in Marvel Comics from the Silver Age (1960) to the Present," http://www.inquiriesjournal.com, accessed 24 Jan 2021.

entitled *Comics*, used appropriated imagery from comics purchased at the store to critique the representation of women in these popular cultural forms. For the virtual installation, a page of a comic book was superimposed over the store window, from which the face of a woman burst out into the viewer's space, constantly rotating in a disorienting manner. The graphic clarity of the imagery was algorithmically distorted, and the forms were fluid, as if the female's identity was not yet fully realized. As critic Mikko Lautamo pointed out in his review of the show for *Square Cylinder* magazine, "Clarke seems to be commenting both on the depiction of women in comics and on the growing presence of female fans in the stereotypically male-only subculture" (Lautamo 2014).

7.10 Over and Over Again

Gioia Fonda's piece, *Over and Over Again* (Figs. 7.9 and 7.10), was sited at Pancake Circus—a largely forgotten, but uniquely unspoiled American 1960s diner, with original exterior design and interior decor. She chose the diner because it typifies how the American urban landscape transforms, leading to businesses or entire neighborhoods falling out of favor: "I'm fascinated by what is built, preserved and celebrated versus what gets demolished, abandoned or forgotten." The location acted as a metaphor for the demise of the Broadway district—forgotten in relation to the city as a whole. Gioia

Fig. 7.9 Gioia Fonda, *Over and Over Again,* 2014, preparatory sketches, used with permission

Fig. 7.10 Gioia Fonda's, *Over and Over Again,* 2014, Augmented Reality, photo: Gioia Fonda, used with permission

chose to create a virtual sculpture that could never be made permanent. The whimsical installation looked like it was made of paper, beads, and wire, and contained animations: a color wheel that rotated, and beads that moved along the lines of wire. It was superimposed onto a billboard above the restaurant, creating a playful juxtaposition with the architecture and signage. As she said in her statement about the piece:

> I came to my concept by virtue of what is generally not possible when it comes to public art. I chose to depict ephemeral craft materials like cardboard, glitter, beads and wire, haphazardly engaging with the architecture of the site. I wanted to create something precarious, impermanent and playful (Fonda, 2014).

Translated into 3D from hand-drawn sketches, it captured the essence of a spontaneously constructed mixed-media sculpture.

The virtual installation was scaled in relation to the building, creating a monumental effect that would be impossible to realize in the real world. In relation to the site, it offered a way to convey the vitality of the diner (having survived intact for several decades) drawing attention to its cultural significance and iconic design.

7.11 The Peaceable Kingdom

Two pieces were located at the city cemetery. Malcolm Cochran's *The Peaceable Kingdom* (Figs. 7.11 and 7.12) was located at a child's grave, a site that resonated with the artist on a personal level. The piece also related closely to permanent public sculptures created by the artist in the past:

> This solitary monument topped by a lamb marking a child's grave caught my eye when I visited the cemetery in November 2013. I was struck by the considerable space around it. Most plots here are dense with memorials. To me, the void—the absence—became a palpable presence. I have chosen to populate it with virtual sculptures derived from Arabia of Finland figurines I have had since childhood, and reiterations of my public sculptures of animals. The resulting grouping is inspired as well by the many versions of *The Peaceable Kingdom* painted by 19th-century folk artist Edward Hicks (Cochran 2014).

The augment consisted of several stylized models of animals—a lion, elephant, buffalo, and horse, encircling the child's grave site in a protective manner, filling up the empty lot. The toy-like 3D model depictions were given a stone texture, integrating them with the stone lamb carved onto the grave marker. In its simplicity and immediacy, the piece communicated a sense of pathos—drawing attention to the grave as a marker of a tragedy but also to the worn and weathered quality of the monument, the identity of its subject long since forgotten. While this augment had a sense of realism intended to convey the solid, physical presence of carved stone, the virtual and fleeting nature of AR as a medium lent itself to the work's themes of memory, loss, and absence.

Fig. 7.11 Malcolm Cochran, *The Peaceable Kingdom,* (in-app screenshot) 2014, Augmented Reality, photo: Rachel Clarke

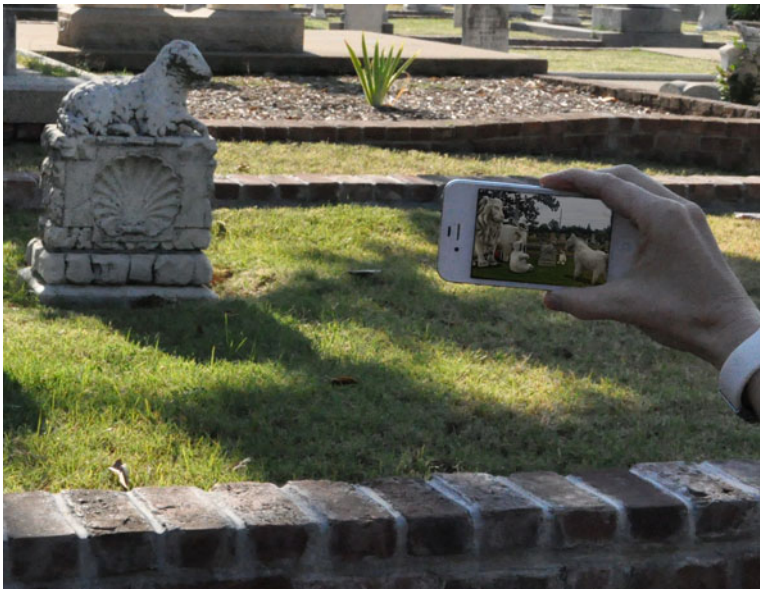

Fig. 7.12 Malcolm Cochran, *Peaceable Kingdom,* 2014, Augmented Reality, 2014, photo: Rachel Clarke

7.12 Unknown

Rebecca Krinke's piece *Unknown* (Fig. 7.13) was also installed in the city cemetery, over the grave of John Sutter, and addressed his historic, commemorative memorial from a contemporary perspective. The original grave monument reads: "John A. Sutter Jr. 1826–1897 founder and planner of City of Sacramento 1848…" Much is left out from this description.[12] Sacramento is the home of the Nisenan and Miwok indigenous people. Sutter's Fort (an agricultural and trade colony) was established in 1839 by Sutter; he enslaved local tribespeople to work for the fort and the slaves were treated brutally. When gold was discovered in the foothills at Sutter's Mill in 1848, many immigrants came to the area to seek their fortune, particularly from other parts of the USA, Europe, and China. Due to the goldrush, Sutter's plans were ruined, his estate was overrun, and the area's population grew dramatically. Sutter's son helped to lay out Sacramento City in 1848. Sacramento was a terminus of the transcontinental railroad, built between 1863 and 1869, which revolutionized the settlement of the American West; Chinese laborers played a huge role in constructing the railroad but were not recognized for their contributions until recently.

Krinke's *Unknown* spoke to this more complex history, as a virtual memorial to the unknown citizens who are buried in the cemetery. In her piece, a golden AR tombstone was superimposed over Sutter's grave, with similar form and structure.

[12] Wikipedia, John Sutter, https://en.wikipedia.org/wiki/John_Sutter, accessed 23 Jan 2021.

Fig. 7.13 Rebecca Krinke, *Unknown*, 2014, Augmented Reality (in-app screenshot), photo: Geoffrey Alan Rhodes, used with permission

The text on the virtual grave stated: "The burial index lists 126 unknown individuals in the city cemetery. 70 were Chinese immigrants. At least 600 unknown victims of the 1850 cholera epidemic are in mass graves in the city cemetery" (Krinke 2014).

Krinke's piece was a meta-monument that commented on the nature of memorializing itself, asking the question: in America, who is remembered and who isn't? Whose stories are told and whose are forgotten? This reinterpretation of Sutter's grave shows how augmented reality can interact subversively with the existing commemorative landscape. Krinke encouraged the viewer to question Sutter's prominence; the version of Sutter as the benevolent city founder that has dominated the mainstream historical narrative, and in covering Sutter, literally and metaphorically, Krinke revealed hidden layers of Sacramento's history that needed to be exposed.

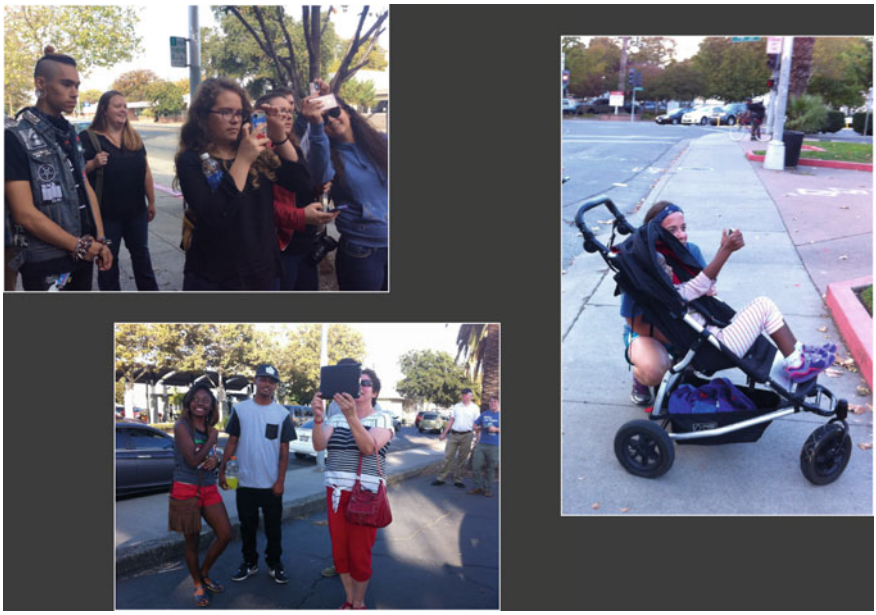

Fig. 7.14 *Broadway Augmented*, 2014, photo: Rachel Clarke

7.13 Public Response

Broadway Augmented was a pioneer project, and despite the limitations of augmented reality technology in 2014, the project was exceptionally well-received. It was publicized extensively through local press, TV stations, and social media.[13] With over 1000 unique downloads of the app recorded, and weekly docent tours, large numbers of people visited the project through its duration (Fig. 7.14), as Geoffrey Alan Rhodes observed in his essay, "Broadway Augmented—Augmented Reality as Virtual Public Art in Sacramento":

> Individuals and couples would arrive, smartphones in hand, to discover the work, letting out satisfied sighs in their independent capturing of the experience, each one navigating a personal journey through the neighborhood's AR experience after reading about the exhibition in the morning newspaper, downloading the app, and venturing forth (Rhodes 2014).

That said, the project had its detractors. None of the works were considered to be offensive, but much like Rachel Whiteread's *House* (Fig. 7.2), there were sentiments to the effect that the project was a waste of public money. Since the very idea of

[13] Broadway Augmented Press: KCRA 3, News 10, Capital Public Radio, Sacramento Bee, Inside the City-November 2014, Sacramento State Hornet-December 2013, Art Projects Magazine, Inside the City-September 2014, Sacramento Business Journal, Sacramento News and Review, Sacramento State Hornet-September 2014, and Square Cylinder Magazine.

augmented reality was so new and innovative at the time, some members of the public did not have a frame of reference for augmented reality art. It was suggested that something impermanent and intangible would be quickly forgotten, and there were some anti-new media opinions voiced that it was not art, but popular entertainment (a "lesser" form). Instead, some said the money should have been spent on a traditional permanent artwork. In the *Sacramento Bee* Ed Fletcher wrote:

> ...not everyone believes that art that can't be seen without a cell phone or tablet is the way to a reinvigorated Broadway. Stan Forbes, owner of the Avid Reader bookstore, described himself as a bit more than sceptical and said he "will be interested to see how many people do it." "I think they will be better off just commissioning some art," Forbes said (Fletcher 2014).

Yet although it was a temporary project, Broadway Augmented captured the public imagination and has stood the test of time; eight years later, it is still remembered, talked about, and has been widely documented for its significance. Much like Christo and Jeanne-Claude's projects (Fig. 7.1), Broadway Augmented embedded itself into the fabric of the community, coming about through a collaboration between many different organizations, interests, and groups both inside and outside the art world—city officials and workers, residents and store owners, art administrators, educators, artists, designers and developers, and students. The locations that Christo and Jeanne-Claude chose were shown in a new light through their interventions, and similarly, the augmentations were an overlay that made Broadway itself more visible, elevating people's consciousness of their real surroundings, as Mikko Lautamo pointed out (Lautamo 2014):

> AR as an event unto itself is a fad, a child drawing on a white wall with a fist full of crayons, destined to be replaced by the more mature perspective of shows like *Broadway Augmented*. Like a Janet Cardiff video walk, AR needs to live and breathe in the space it inhabits, first succumbing to then augmenting the realities of communities where people actually live and work (Lautamo 2014).

While in its initial stages the commissioning agency thought of augmented reality as a tool for prototyping public art projects that could be realized as physical works, the project demonstrated that augmented reality was inherently compelling as a form of site-specific public art. The artists selected to participate were chosen because of the diverse range of practices they employed in their work. Given the opportunity to use augmented reality, the translation of these artists' practices into the virtual domain showed how augmented reality could extend public art and also how artists could extend the visual language of augmented reality.

Another significant aspect of the project was audience interaction. *Broadway Augmented* was a unique experience for each visitor, each taking a different journey, using a different device, and interacting with the work in their own way. Participants captured themselves in juxtapositions and selfie interactions with the installations, showing a personal investment in the project (Fig. 7.15). With consent, the submitted selfies and portraits were displayed as an online gallery connected to the project. This crowd-sourced gallery emerged unexpectedly and showed a potential for increased audience engagement in public art through networked technologies.

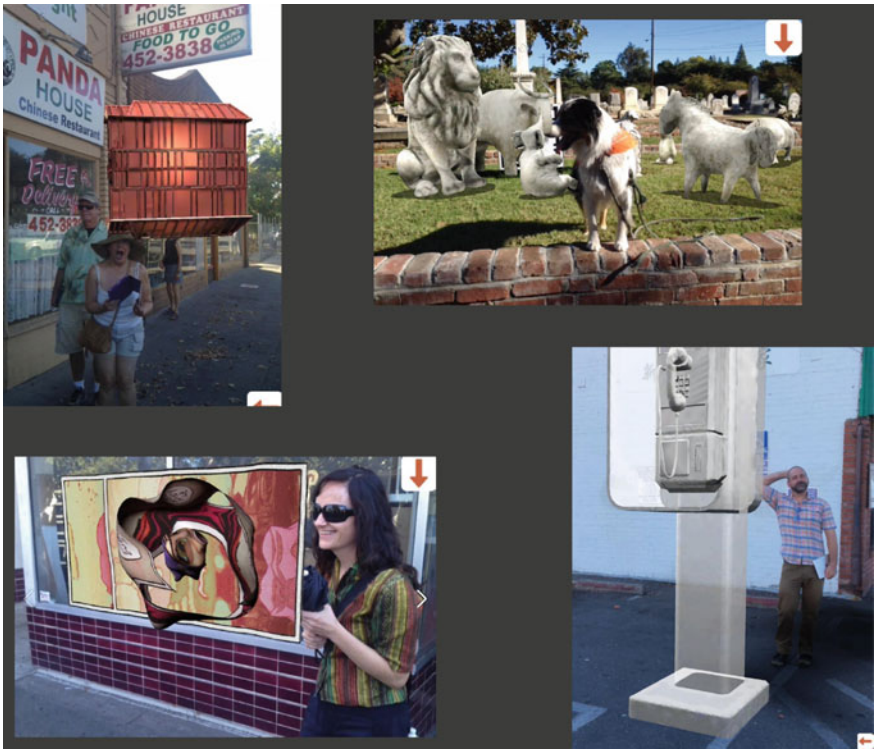

Fig. 7.15 Selfies and portraits, *Broadway Augmented* 2014, in-app screenshots

7.14 Augmented Reality as a Reinvention of Site-Specific Art

Projects like *Broadway Augmented* reinforced the idea that public art does not have to be tied to tangible space—augmented reality exists in a relationship between physical and virtual realities, creating a new kind of site. By leveraging the full capabilities of augmented reality as temporary public art possible in 2014, *Broadway Augmented* also showed the potential for augmented reality to be a new vehicle for meaningful expressions of human connection to physical spaces.

Moving into the present (2022), advancements in mobile devices, geo-positioning, and augmented reality development frameworks have opened up new possibilities for artists to create augmented reality experiences that further expand the definition of temporary public art. Geo-positioning technologies now allow for more reliable placement of augmented reality elements into the environment at exact locations (using geo-markers) making the realization of large-scale site-specific augmented reality works more feasible (Sects. 7.16 and 7.17). In non-GPS augmented reality works, virtual objects have to be anchored into the user's environment; this can

be done using (amongst others) image and plane tracking. Using AR Foundation ARKit/ARCore-support, mobile devices can detect planar surfaces in the user's surroundings, which facilitates very realistic anchoring of virtual objects onto horizontal and vertical planes mapped to the user's surroundings. Apple's recent inclusion of a LiDAR scanner on their phones (from 2020 onwards) provides additional infrared depth sensing, facilitating depth and occlusion anchoring. Will Pappenheimer has been exploring this technology in his practice (Sect. 7.15) and describes it in the following way:

> This process uses both camera angle comparisons and infrared depth sensing which is what LiDAR brings to the technology. The new AR technologies anchor, create occlusion and depth hierarchy instantly in order to keep AR additions to the environment stable and realistically integrated for as long as an AR "session" takes place on a mobile device (Pappenheimer 2022).

In addition to these advancements, WiFi and cellular networks are pervasive, allowing for fast downloads of AR content. AR app content can be easily integrated with social media platforms for a greater degree of user interaction and engagement. The universal adoption of smartphones, ubiquitous networks, and advancements in AR technology mean high-quality AR experiences located in public space can reach a wide audience in an immediate and direct way. Augmented reality is a powerful tool for artists to use in reimagining the landscape, and it lends itself to community engagement, the exploration of timely social content, and digital activism. Projects that exemplify these uses of AR will be discussed in Sects. 7.15–7.18.

7.15 Distributed Sites

In his recent *Painter* projects (Fig. 7.16), Will Pappenheimer uses the camera's LiDAR scanning and the AR development framework to scan real-world geometry and generate a spatial mesh from it. He makes the normally invisible mesh (typically

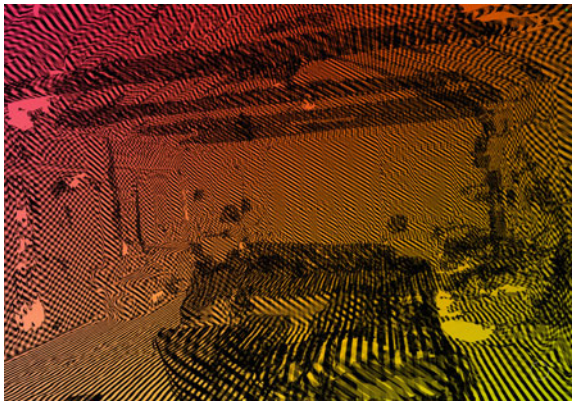

Fig. 7.16 Will Pappenheimer, *LinePainter #2, BlindAR Interiors*, 2022, custom AR App (in-app screenshot), photo: Will Pappenheimer, used with permission

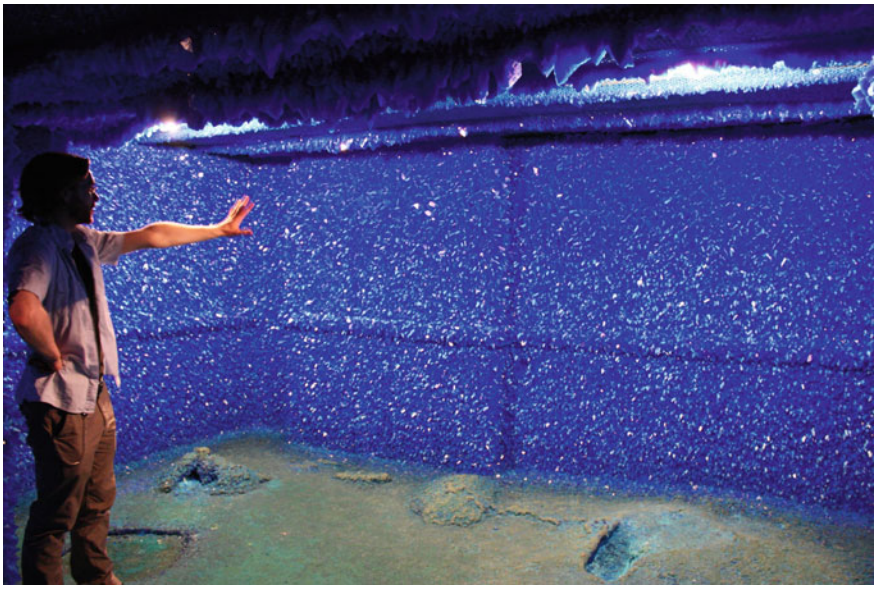

Fig. 7.17 Roger Hiorns, *Seizure*, 2008, site-specific temporary installation, photo: Hilary Perkins, via flikr https://www.flickr.com/photos/cowbite/3782427522/in/photostream/ with Creative Commons Licensing

only used to anchor AR elements) visible with his own colorations, or paintings, which appear as patterned surface textures over the scanned physical space. As a mobile device is moved through a space or over a building, his painted meshes are generated and grow continuously, attaching to newly visible surfaces to create dazzling, immersive, mixed-reality experiences he likens to being inside a painting.

The shift in perception that happens when a foreign entity grows over a familiar space is reminiscent of *Seizure*, Roger Hiorns's transformation of a London apartment (Fig. 7.17). By growing brilliant blue copper sulfate crystals over the surfaces of the rooms, Hiorns created an entirely different experience of reality. But in the case of Pappenheimer's app, the surface transformation is not fixed, itis instantaneous, evolving in real-time, and could be applied to any location.

Similar to Christo and Jeanne-Claude's wrappings, Pappenheimer is creating a second skin that both conceals and reveals the surfaces it is covering. As Pappenheimer says:

> Describing this as "painting" also for me points to how painting is a thin transformative skin over the canvas the same way meshes are (thin) "skinned" with images which give them "objectness." So there is an important confusion or interplay between surface and depth (artificial and natural) in both cases that questions the typical hierarchy (Pappenheimer 2022).

Pappenheimer's paintings both articulate and camouflage the spaces they wrap, creating an ambiguous other-space. Using this app, immersive, temporary installations could be created in any location, making it possible for the user to generate their own site-specific work.

Similarly, in Nancy Baker Cahill's app, 4th Wall, Cahill offers her "dimensional drawings translated from VR to AR to users so that they can create their own context and content with the works, locating them anywhere in the world" (Cahill 2020). The user can place one of Cahill's drawings into a location of their choice and then can use the 4th Wall app to photograph it in situ. In both Pappenheimer and Cahill's work, the user defines the site and then creates (and records) a temporary installation of the work, making their own connection between the site and the work, and greatly expanding the notion of site-specificity.

7.16 Environmental Activism

A compelling example of augmented reality site-specific public art used as climate activism was *Unmoored (2018)* by Mel Chin, a mixed-reality project developed in partnership with Microsoft and geo-located in Times Square. Realized on a massive scale, the installation was immersive and cinematic, integrating augmented reality elements with the sensory overload of screens, crowds, and corporate architecture that characterize the location.[14,15]

A flotilla of AR boats floated in the air above the square at a newly imagined sea level. Looking up at the hulls of boats passing by 26 ft above them, viewers had an unfamiliar subterranean perspective, creating a sense of uncertainty and vulnerability. The shipping traffic increased over time so that the space above them became increasingly congested with vessels. Atmospheric sounds would result from boat collisions, while other flotsam and jetsam floated around them in the watery motion. This emotionally potent installation was intended to work on different levels, evoking an immediate visceral reaction, but leaving a more lasting impression of the alarming reality of impending sea-level rise. The installation was located in Times Square to communicate the urgency of climate change to the largest audience possible—a large, changing crowd that may not necessarily visit an art gallery. The use of ubiquitous technology was also part of the intention; Mel Chin spoke about social disengagement that has resulted from overuse of mobile devices. Using the viewer's phone to reach them in a meaningful way was intended to inverse this tendency, and elicit empathy and a shared human connection.

[14] Chin, Mel. Unmoored, https://melchin.org/oeuvre/unmoored/, accessed 23 Jan 2022.

[15] Microsoft, "Behind the scenes of Unmorred with artist Mel Chin" https://www.youtube.com/watch?v=0hPP0cHHubM, accessed 23 Jan 2022.

7.17 Augmented Reality, Racial Justice, and the Commemorative Landscape

In several recent projects, augmented reality as temporary public art has facilitated racial justice dialogues around controversial public statues. After the Black Lives Matter protests over the death of George Floyd in summer 2020, a public reckoning occurred that led many to re-examine the commemorative landscape and ask why most statues and monuments in public spaces were symbols of systemic racism and colonialism, honoring land barons, colonists, and settlers. During the latter part of 2020, statues in US cities were removed by protestors and city officials alike. In Sacramento, two statues associated with colonialism and settler culture, those of Junipero de Serra, 1713–1784 (Spanish Catholic priest and founder of the California Missions) and John Sutter 1803–1880 (founder of Sacramento) were removed, one by protestors and the other by Sutter Health after it was vandalized. Augmented reality is being used to re-envision existing monument sites, such as those. In The Pedestal Project (2021) created by Color of Change (a national online racial justice organization), users could place virtual statues of racial justice leaders John Lewis, Alicia Garza, and Chelsea Miller (envisioned by artist Spencer Evans) onto empty pedestals where removed confederate statues once stood. As the project website states:

> *The Pedestal Project* is an Augmented Reality experience that lets you replace symbols of racism with symbols of equality...As contentious statues come down all across America it's time to place symbols of progress in their stead...users will be able to select from a gallery of statues, place it atop an empty pedestal and in the activists' own voice, hear why change is worth fighting for (Pedestal Project 2021).

The Pedestal Project was national; the virtual sculptures of racial justice leaders could appear on empty pedestals all over the USA, creating widely distributed content. Participants were also encouraged to share screenshots of the virtual statues in situ on their social media networks, disseminating the virtual transformation of these spaces.

Similarly in *Monument Public Address System* (Fig. 7.18), a work-in-progress by Meredith Drum, audio and animated content collected from community interviews about monuments as symbols of injustice will be geo-located at the sites of confederate and colonial monuments.

> *Monument Public Address System AR* is offered as a platform for visual and aural expressions of frustration, anger, sadness, fear, and confusion regarding the racist, unjust and violent narratives that have shaped, and continue to shape, our present and future. It is also built for the enunciation of anti-racist hopes, activities and initiatives. The aim is to support critical thinking about the future of public monuments and spark conversations on the history of slavery and racism in the United States (Drum 2021).

Both *The Pedestal Project* and *Monument Public Address System AR* are multi-layered works that engage participants in acts of empowerment; they exist in relation to monument sites and intervene in the debate about their future.

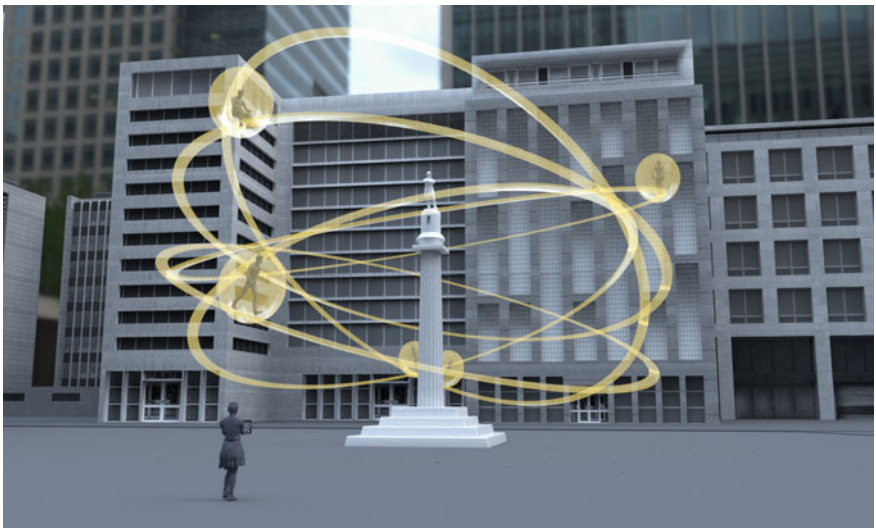

Fig. 7.18 Meredith Drum, *Monument Public Address System AR*, 2021, prototype for augmented reality (AR) documentary app, image: Meredith Drum, used with permission

7.18 Deconstructed Monuments, Alternate Narratives and Storytelling

In *Invisible Monument,* an augmented reality geo-location soundscape app by Halsey Burgund and Lara Baladi (2015—present)[16] app users are co-creators, contributing their audio-recorded personal accounts of uprisings around the globe. These recordings are then geo-located, placed in spaces where social protests occurred. Users can relive the experience of the event through the participant's words and can contribute their own thoughts. Thinking back to Krinke's project *Unknown* (for Broadway Augmented) (Fig. 7.12) and its commentary on Sutter's grave and excluded historical narratives, *Invisible Monument* very successfully addresses the use of diverse primary sources. In *Invisible Monument,* participants have a pivotal role, telling their own stories, expressing their opinions, and shaping how historic events might be understood in the future. The content of the project is created by participants; the artists simply provide the platform for the retelling to occur. The title of the project *Invisible Monument* speaks to the idea that through augmented reality a site-specific monument does not have to have a physical or even visible presence. Instead, it can be an experience—transparent, ephemeral, and constantly evolving over time.

[16] Invisible Monument, 2015 https://docubase.mit.edu/project/invisible-monument/, accessed 24 Jan 2022.

The possibilities for alternate narratives and storytelling through AR is seen in *Monumental Perspectives* (2021—ongoing),[17,18] a project organized by the Los Angeles County Museum and Snap Inc., featuring augmented reality installations by local artists—Ruben Ochoa, Glenn Kaino, Mercedes Dorame, I.R. Bach, and Ada Pinkston. The works explore personal and collective stories about the artists' communities, revealing perspectives that are underrepresented in public art. The works are located at public sites throughout the city and include Mercedes Dorame's *Portal for Tovaangar*, a virtual portal invoking the continuous presence of the Indigenous Gabrielino/Tongva people, native to LA; and Ruben Ochoa's ¡*Vendedores, Presente*! in McArthur Park, featuring an installation of virtual food carts floating above the park as a vibrant, celebratory tribute to Mexican and Central American immigrant street vendors.

7.19 Conclusion

In this chapter, augmented reality was discussed both as a reinvention of temporary public art, and a reinvention of the notion of a site. Inherently anti-monumental, augmented reality has extended the visual language, form, content, audience, and engagement in site-specific art. It has made it possible for artists working in public spaces to be more responsive to social change. Through dissemination on mobile devices, it has become one of the most accessible forms of contemporary art, as well as the most participatory. While there are a significant number of new media artists working in this field, many of the artists discussed in this essay have collaborated with 3D modelers, developers, and technologists to realize their works, and this collaborative aspect has made augmented reality available to a wider number of creators. As an experiential and temporal form of art, AR can offer a vital and dynamic expression of human experience in the contemporary moment: engaging the viewer in a living dialog; offering new ways to understand the world; and allowing the viewer to fundamentally reimagine the relationship of art to public space.

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[18] PBS Newshour, 7 May 2021, Artists reimagine monuments through augmented reality, https://www.pbs.org/video/tech-art-1625516210/, accessed 24 Jan 2022.

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Chapter 8
Data Narratives: Aesthetic Activation of Urban Space Through Augmented Reality

Conor McGarrigle and John Buckley

8.1 Introduction

This project has its origins in Namaland, an AR artwork by Conor McGarrigle from 2010. At that time, AR seemed to be on the cusp of a breakthrough, moving from a marginal technology of interest to pioneers, specialist users and artists chasing that moment of emergence of a new technology. Coming off the critical and aesthetic innovation of locative media and the explosion in ubiquitous mobile and location-based technology, we were, according to best estimates, perhaps six months or a year from the killer app that would propel AR into everyone's pocket as an indispensable tool to augment our mobile-first world. This breakthrough did not happen, which is not to say that AR technology went away or failed to advance, but it did not enter the mainstream in a significant way even as the cell phone colonized all aspects of everyday life. Today, while surveying the current state of the art in AR, the sense of déjà vu is strong. Once again AR is on the verge of another breakthrough in maybe six months down the line, a year at most, but this time, it is for real. The top technology companies in the world, Apple, Google (Alphabet), Microsoft and Facebook (Meta) have bet big on the metaverse, and along with virtual reality, AR is part of this extended reality (XR) future. We are living in what Paul Dourish and Geneviève Bell back in 2004 described as the proximate future, an in-between time where the upgrade is almost within reach in a Gibsonian act of redistribution of the assets, knowledges and customs of the future. The project in question for this chapter followed a break in this artist working with AR technology in their creative

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practice. On returning to the medium previous mobile-based platforms familiar from this period as the pioneers and likely leaders of the AR wave had fallen by the wayside through acquisition, failure, mission pivots and exhausting funding without successfully monetizing their platforms. Two developments seemed to have changed that; Apple's *ARkit* and Google/Alphabet's *ARCore* in conjunction with Unity's 3D software development kit which together offered a powerful suite of methods and tools that, in combination with the increased processing power and sensor and camera capabilities of the latest generation of cell phones and mobile devices, have enabled a more sophisticated and precise augmentation of space with a broader range of media and data. While these SDKs have afforded powerful app-based AR infrastructure increasing the reach of AR applications, they have commensurately increased the learning curve and resources needed to create AR applications, thus reducing the opportunities for real engagement from artists and hackers without access to requisite resources. The exceptions to this trend have been the recent advent of fully featured development tools aimed at creatives with limited coding ability such as Facebook's *Spark AR Studio* and Snap's *Lens Studio* which have lowered the barriers to access while strictly confining the outputs within their respective walled gardens.[1]

This chapter situates itself within this evolving context with an account of the development process for an artistic AR project that arose from a residency programme in a research environment that looked at city dashboards and urban data.

8.2 The Programmable City Artist in Residence

The project arose from a period as artist in residence with the Science Foundation Ireland funded Building City Dashboards research project, a project that saw its origins in Maynooth University's ERC funded Programmable City research project (Kitchin 2021, pp. 69–78). The project had begun by building a prototype of a Dublin Dashboard, an accessible web dashboard that presented key indicators of the functioning of Dublin city drawn from sources of open civic data. Based at Maynooth University under the direction of Rob Kitchin in conjunction with Dublin City Council, the project developed the Dublin City Dashboard (Young, Kitchin and Naji 2021) while researching the broader implications of city dashboards and civic open data. The artistic residency programme directed by Maynooth University Professor and artist Jeneen Naji invited artists to create a digital artwork using open data from the Dublin and/or Cork dashboards.[2] The goal was to 'explore and expand multimodal creative expression in the digital space using open urban data and to extend the work of the dashboard visualization and the public impact of the

[1] Despite this, these tools have enabled a wave of high quality critical creative outputs orientated around AR filters demonstrating that these constraints are not anathema to critical creative work, see for example the curatorial practice of Zaiba Jabbar https://www.hervisions.world/

[2] See http://www.dublindashboard.ie/ and http://www.corkdashboard.ie.

research through an open competition for media artists to research and build alternative data tools, app and representations'. This would be achieved through a period working within the project with privileged access to data, project researchers and expertise built up within the associated project teams of four PIs, eleven post-doctoral researchers and eight PhD students with partners including Ordnance Survey Ireland, Central Statistics Office, Smart Dublin and Smart Cork Gateway. The selected artists were free to work independently with the support of, and in dialogue with, the project team.

8.3 The Spatiality of Data Narratives

The art project initially had three principal objectives: an exploration of urban data with a focus on its relationship with place and its spatiality; uncovering locative data narratives, that is stories that could be told by and through the data that describes the city; and finally delivering an aesthetic experience through augmenting the space of the city in ways that meaningfully relate to the experience of being in the city. These objectives were premised on an acknowledgement that city dashboards are by nature entangled with smart city narratives, but are also instrumental in evolving understandings of the smart city that can be distinguished from early technocratic versions promoted by hardware manufacturers such as Siemens, IBM and HP, to the more nuanced readings of the smart city today (Townsend 2013; Picon 2015). This is allied to developments in critical data studies where the idea that data are neutral and objective, simply reflections of reality that are operationalized in smart systems, has been comprehensively dismantled in recent scholarship, giving way to more wide-ranging accounts of bias and discrimination baked into AI systems traced back to fundamental flaws in the nature of training data (Crawford 2021; Eubanks 2018; D'Ignazio and Klein 2020; Noble 2018). Data, in this reading, are never raw but always already cooked (Gitelman 2013) the result of contingent processes of selection and processing that do work in the world.

The approach followed in the project is additionally informed by an understanding of the city being developed through a European funded research project, *The Real Smart City*,[3] one of our chapter's authors is an investigator on. The data city approach (McGarrigle 2021) is a recognition that the contemporary city is always already enmeshed in data with every action generating and described by data with complex algorithmic processes producing space; leading to considerations, for example, of how data defines the space of the city and is defined by it, how data assemblages are enacted in space and in that process change the space itself, and how data bind all aspects of the networked every day, human and non-human, in the space of the contemporary city. From data footprints to data shadows, digital doppelgängers and

[3] A three-year Marie Skłodowska-Curie RISE (Research and Innovation Staff Exchange) Action Programme led by TU Dublin's Graduate School of Creative Arts and Media and funded under the EU's Horizon 2020 research and innovation programme, grant agreement No.777707.

data doubles, these data form accounts of our embodied presence in the city. They are spatial and relational, bringing together embodied presence and its entanglements with myriad systems that form our everyday lives, from the urban governance of the smart city to personal and public presences of social media to the sociotechnical assemblages of surveillance capitalism. Thus, we understand the city and our presence in it by following the data. Even as it follows the data, the data city approach is most urgently concerned with urban inhabitants: where do communities and individuals fit within these technological systems, as data subjects within vast data assemblages that see human activity as a source for data extraction, modelling and nudging, or as critical users with the agency to mould the city and its systems to reflect their concerns and desires? This approach thus goes beyond concepts of the smart city with its focus on city governance and infrastructural emphasis to encompass the pervasive reach of data extraction, from location on cell phones to social media interactions, purchases and consumption and so forth, amid the multiplicitous digital entanglements of urban life.

This is connected to influential activist strands of urban philosophy inspired by the writings of Henri Lefebvre, Michel deCerteau and Jane Jacobs who see possibilities for human agency in the city that can be revealed through focusing on what people do within the urban systems they inhabit, acknowledging that even within pervasive urban technological systems of governance, surveillance and control within the complexity of the city there are always gaps, hacks, workarounds and omissions. The data city approach is to recognize that everything in the city produces and is described by data, moving beyond ideas of the smart city with its infrastructural and governance focus to more intimate and individualized regimes of data capture. The fallacy of data models is that data can describe all aspects of urban life from the most idiosyncratic, whereas in fact these models are reductive approximations of the complexity of lived experience (Amoore 2020; Cheney-Lippold 2017). It is within this context that data are extracted from the practices of everyday life through pervasive digital processes; these data are used to describe and build predictive models (or AI) which are then operationalized in the world through systems that are increasingly recognized as fundamentally biased and flawed (Crawford 2021; Eubanks 2018; D'Ignazio and Klein 2020; Noble 2018). Identifying these flaws and developing methodologies, heuristics and epistemological structures to provide remedies, oversight and new modes of operation is of urgent importance to maintain confidence in data powered systems and, it is recognized, the wicked nature of this problem (Rittel and Webber 1973; Brown et al. 2010) of necessity calls for transdisciplinary approaches of which artistic AR practice are but one small part of this endeavour.

The geographer Rob Kitchin, who with media artist Jeneen Naji conceived of the residency programme at Maynooth University, suggests that telling data stories, 'interconnected stories about how data are produced, processed and interpreted, and the consequences of living in a data- driven world' (2021, p. 8) offers another dimension to how we understand data and its consequences in the world that can support and contextualize more traditional academic approaches. *Data Narratives* follows this idea to ask what happens if our data stories are made visible in space in the places to which they refer; both the stories we tell about ourselves and the narratives by

which we are understood to regimes of planning and governance. Furthermore, the process of making them visible through our digital devices, of rendering them not only visible but locationally specific, through a process of over layering these contextual data layers, is seen to highlight the coextension of place and data. It demonstrates the hybridity of all space as data space, as all data are locational and all locations described by data. Of course, at one level, we are aware of this, but it is, we suggest, another thing to see this specific data materialized through augmented reality in real space. However, unlike the data we are generating through our digital interactions, the data materialized through this artwork do very little other than appearing as reductive descriptions that afford the viewer no agency in interacting, commenting or amending them. They make visible data that are predetermined by processes over which the audience has no control. This is central to the ambitions for the project, to make visible some strands of the data narratives that are told of the city and its inhabitants as data subjects,[4] narratives most often generated without their oversight or input. The details of this initial idea would be determined by the availability of data at sufficiently granular a level so that it would refer to discrete locations and districts, and to identify from this the types of stories that could be told by the data. This was established during the research portion of the residency.

8.4 Working with Data

The objective of the residency was to explore such multi-modal readings of urban data in ways that would make urban data more visible, increase engagement and promote alternative dimensions to these data through a range of approaches, aesthetic, activist and narrative. Through a process of consultation and discussion with the dashboard research team, available data were sifted and explored. At one level assessing it for its narrative value and, at a more practical level, its detail and freshness—there were many data that were sparse and infrequently updated—and availability for use in a public artwork, which effectively excluded much operational data that were restricted for valid reasons of privacy. The decision was made to work with a combination of data sources: fine-grained census data that detailed a range of urban parameters that told of the inhabitants of neighbourhoods in the city of Dublin, locationally specific housing cost data obtained from a variety of sources and collated by Maynooth University data scientists, data scraped from the Airbnb platform by activist website Inside Airbnb, and finally data scraped by the artist from the Twitter API on the hashtag #HousingCrisis geographically constrained to the city of Dublin and environs, revealing an active conversation that was reflective of a range of attitudes to the housing crisis.

[4] In European GDPR the data subject is the legal term for a person whose data is collected and subject to processes of analysis.

The official census data are the gold standard data record of the entire population, detailed down to urban 'small areas'[5] but with a limited number of parameters that included household size, annual income, car ownership, Internet connectivity, nationality and native language. The authors combined this with locational information on housing costs sourced from Daft. A housing rental website that used its listing data to provide the most detailed tracker of housing prices in the city. The objective was to bring together data representations of the city's inhabitants and their changing nature and the ways they are understood at an official level, with this portrait further contextualized by the perspective of a hyper-active housing market that, as it spiralled out of control, impacted on these individual narratives of Dublin; a city still at the time recovering from the worst economic crisis for generations and the humiliation of a Troika bailout. While these data were instructive, they lacked personal narrative. Income brackets and average rents combined with occupation densities allow us to speculate, for example, that in certain areas of the city, the convergence of these factors results in overcrowded accommodation, but they are cold facts that lack emotional traction unless you are personally priced out of a place to call home. In order to supplement these factual data, I turned to another factor widely believed to be implicated in the rent crisis; the property sharing platform Airbnb.

While at this time, 2018, there was little official information on the scale of Airbnb's activity in Dublin or elsewhere, Airbnb was believed to be a significant contributor to the increase in rents and the lack of availability of property to rent; properties that would normally be rented were now achieving a higher return through short term rents of Airbnb. (Harris 2018) I was able to access data from an unofficial source, Inside Airbnb[6] an activist website created by digital storyteller Murray Cox, that detailed the extent of their activity through an ongoing programme of data scraping (Fig. 8.1). While Airbnb maintained that its service was a room sharing service that augmented homeowners' income, these data detailed the number of entire homes available on Airbnb which in August 2018 was more than double the number available to rent; clearly, an unregulated Airbnb was part of the problem.

After some time exploring the Airbnb data, two categories stood out; the property descriptions which typically included a description not only of the property to rent but also the neighbourhood and the 'host' or renter and the 'guest reviews', that is reviews left of specific properties by their customers. These offered an alternative perspective of these rentals, their place in the city and the guests, tourists, visitors and people passing through. On the surface casual and informal but for the reputational economy of the service, a vital part of the mechanisms establishing reputations, not only of the rental but also of the customer, and something of their interrelationships. Or at least, those premised on this commercial relationship even as it presented, in the Airbnb model, itself as a guest and host relationship with most of the reviews coached in these terms. The final component was the data scraped from Twitter's #HousingCrisis hashtag. This data, the text of the tweets, accessed more directly the

[5] Of approximately 80–120 households see https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/.

[6] See http://insideairbnb.com/behind.html.

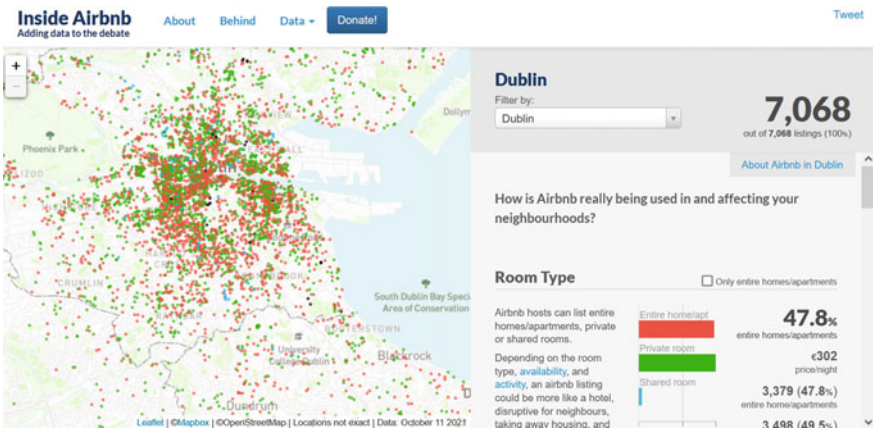

Fig. 8.1 Inside Airbnb mapping of Airbnb rentals in Dublin

visceral anger, frustration and hopelessness of those caught in the crisis alongside a dynamic and impassioned debate on policy and what was seen as governmental inaction. Together, it was hoped, these data sources would reflect limited samples of the flows of data the city was enmeshed in, representing the differing, and often competing data narratives of the city and its inhabitants.

8.5 The Data Narratives App

After some experimentation, it was decided the objective was to build a mobile app that would read the user's location and over-layer a locational specific range of these data (Fig. 8.2), thus augmenting the user's space with several competing and complementary narratives that arise from data. Narratives that it becomes apparent are incomplete, partial, contradictory and subjective but each representative of a perspective—a version of place—that describes and shapes the life world through disciplinary lenses: the city planner, the real estate market, the multi-national giant of the sharing economy. The narrative of the individual living in the city shaped by these forces was largely absent in this fragmented making visible of these narratives, representing the reality of the situation where individual city dwellers voices do not feature prominently in planning housing policy.

After a process of identification and sorting of data points, data were categorized into locational areas—this coalesced into Dublin's local election city wards, small areas averaging populations of 1500–3000 for which detailed demographic statistics were available. For each of the 114 city wards, a data set was constructed with key demographic information: population; household size, number of children, native language, economic indicators such as average house price, average rent, vacant properties, number of full-time Airbnbs, households without Internet, car ownership.

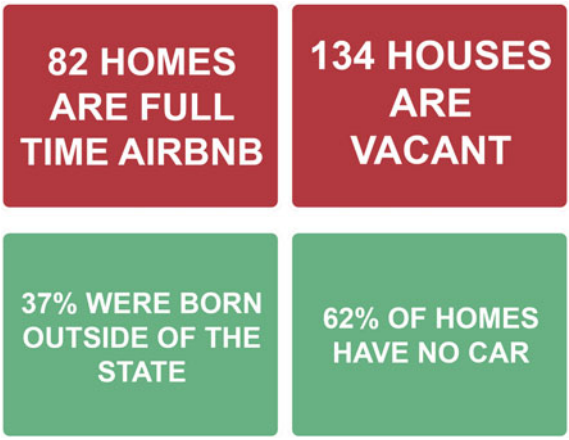

Fig. 8.2 Examples of the data placards that were over-layered within city wards through AR

The final components were the review narratives about the experience of being in these areas from the perspectives of the Airbnb visitors. Each piece of data was categorized into four broad categories; demographic, infrastructural, economic and narrative to be presented as colour coded virtual placards that would provide a digital overlay to populate the augmented perspective of the project's audience once they entered each of the small areas of Dublin's city centre (Fig. 8.3).

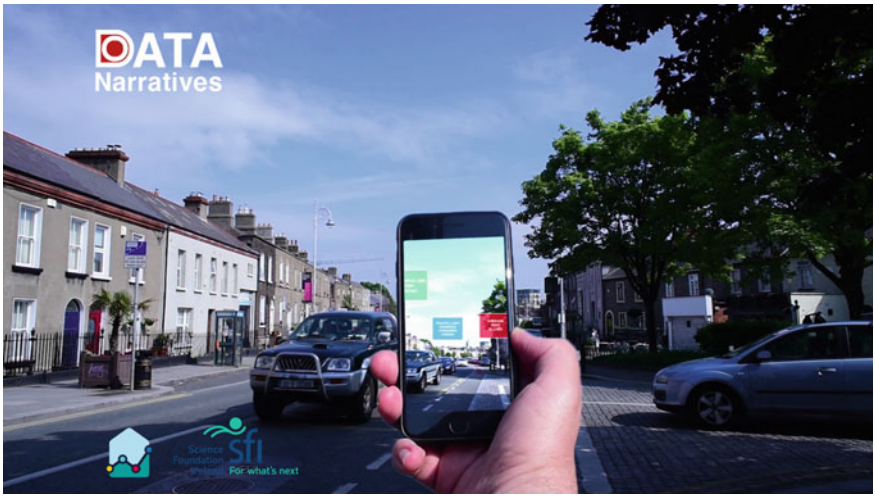

Fig. 8.3 Data narratives app in operation

8.6 AR Development

The development stage of the project coincided with an upsurge in AR tool development and the sense that recent developments in computer vision were emerging from research labs into the hands of developers and artists as useful tool sets. Before Apple's recent entry (at the time) with ARKit and Google's competing offer with ARCore, the only significant development platform was Vuforia, then owned by mobile chipset manufacturer Qualcomm, that allowed for simple image tracking where artists and developers used fiducial tracking markers to track 3D/spatial content. Vuforia's system was relatively easy to implement and had the added benefit of a free licence for non-commercial projects. However, Vuforia at the time had no planar or ground tracking, a feature being heavily promoted by the AR newcomers (ARKit/Core) at the time and one that seemed to be a key asset for this project.

The primary focus of *Data Narratives* was to overlay these data onto placards in specific locations defined by GPS coordinates. However, much like the often-quoted problem of the 'last mile' for fixed line telecoms delivery, GPS suffers from a 'last metre' problem that obstructs accurate placement of AR objects. Although it is indeed possible for a Google Maps hybrid positioning-based placement of the user with a much closer resolution, these are not available to use as they are dependent on position data from cell towers which is only available by costly licencing arrangements. It is interesting to note that whereas GPS positionality is freely available it is not sufficiently reliable in urban conditions, the greater resolution emanating from network carriers is proprietary, raising concerns over locational privacy as with recent concerns over law enforcement dragnet use of Google's Sensor Vault location database. (Valentino-DeVries 2019) Such problems of overcoming the 'walled garden' problem arise time and again for artists working in this field as we will see.

As GPS location is only accurate to within a few metres the possibility of exploring the possibility of tethering placards to specific locations using object recognition algorithms, that both ARKit and ARCore heralded as major innovations, to track off buildings in each area. Whereas it was claimed that object-based recognition could work outdoors, it was found that it was not possible to overcome the limitations of the device camera in an outdoor setting. For example, fast changing lighting conditions particularly under Irish conditions impacted the system's ability to recognize a surface. It was only in tightly controlled indoor settings with an evenly lit subject that the process could be made to work. Moving to generic ground or horizontal plane tracking and floating upright placards gave favourable results as ground plane detection has the added benefit of having the camera fill its field of vision with a relatively stable exposure without blowing out, as you would when you attempt to track anything horizontal that would bring a brightly lit sky or indeed the sun into play. While working well for the data placards, it was less successful for applications that required a greater degree of precision.

A perennial issue for artists and developers working with emerging technologies is negotiating the discontinuities between the development cycles of both Apple (IOS) and Google (Android) platforms. At any one time, either SDK (ARKit or

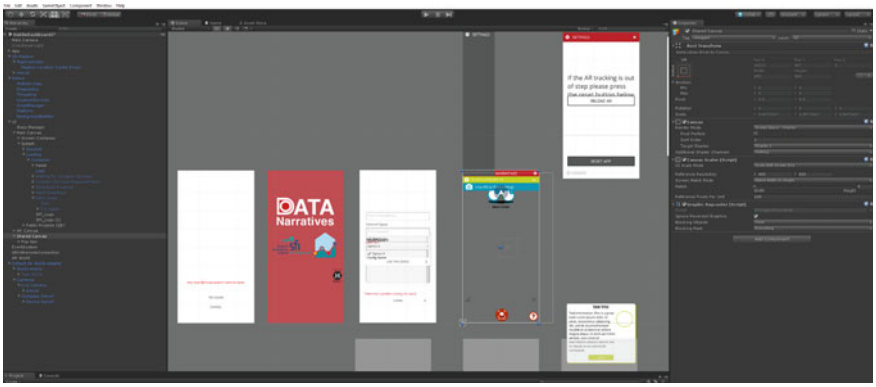

Fig. 8.4 Unity project screen capture

ARCore) may allow certain functionalities not present on another and users must wait until one catches up or even supersedes the other. While clearly driven by marketing exigencies, this adds to confusion and frustration in using these platforms where specific features tied to platforms hampers creativity as it shoehorns artists into forced platform decisions based on feature availability. 3D game engine software Unity has since attempted to overcome these difficulties by releasing its own SDK, AR Foundation, that seeks to be device agnostic, allowing artists and developers to work on a unified library of functions that switches automatically behind the scenes at application build time depending on what device is called for. Unity, as a third-party content creation platform without hardware interests, is uniquely placed to provide cross-platform tools that foreground content creation that is device agnostic. However, while Unity is well known to 3D and game artists, it still represents a complex environment (Fig. 8.4) with a steep learning curve and requires building the results as apps which, in contrast to a previous generation of AR platforms like Layar, is a daunting prospect for many artists.

8.7 AR as Emerging Vapourware

In an early version of the project development, a number of experts and stakeholders were interviewed on the housing crisis and what they saw as its causes and potential cures. These interviews, which were recorded in a green-screen facility, were then edited into short excerpt clips of 2–3 min duration and processed with transparent backgrounds and optimized to form a seamless augmented reality overlay. Each clip spoke to a specific issue related to the housing crisis that was locationally specific, with these clips then geotagged to be shown at specific locations. The plan was to have experts virtually appear as video overlays at specific locations to contextualize the housing crisis in relation to the user's location. The promise of the newer AR

SDKs being offered by Apple and Google was the enhanced ground-plane feature that is the ability to detect flat surfaces in the camera view and to place objects accurately on these surfaces without the need for marker patterns or images. This it was hoped would allow the app to place these videos as augmented overlays so that the speakers would appear to stand on the ground wherever the user activated the video to deliver their location-specific perspective on a one-to-one basis, thus augmenting their space with an interpretative layer that challenged the official version that the government was promoting. AR traditionally has had this ability only in well-lit controlled environments; it will most likely work in an indoor location with a flat surface and good lighting. However, in an uncontrolled exterior space with diverse and quickly changing light sources in addition to uneven surfaces, this ability breaks down in the face of this complex visual scenario. AR applications typically overcame this with marker images, specifically designed images that could be identified as the ground plane allowing the accurate placement of the augmented asset. As the ambition for the project was for a self-guided tour where users could use the app without guidance or specific set-up, it needed to work without the need for specific markers to be physically placed in the real-world space for it to function. After comprehensive testing, we discovered that the ability of markerless ground plane detection promoted by both ARCore and ARKit was in fact vapourware and not available in real world scenarios. The results achieved in testing had the expert video clips appearing erratically depending on the conditions, occasionally working as intended but most often floating above ground plane surfaces in an unpredictable fashion (Fig. 8.5). As the intent of the work was to maximize access to the widest levels of devices, we reluctantly abandoned this aspect of the work with a resolve to revisit it at a later date when the technology would be sufficiently advanced to deliver the promise. This is certainly one of the issues when working with advanced AR

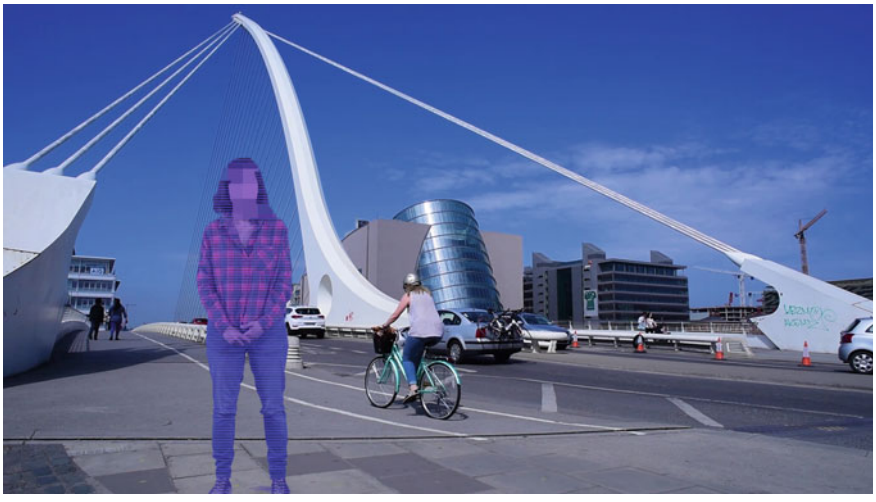

Fig. 8.5 Early test of a video overlaid over camera view

technology, the cutting edge is also the bleeding edge; where contingency impacts at a frequency that we are unaccustomed to in our everyday use of digital technology—particularly cell phones—where the technology has become almost seamless for users who are not early adaptors. With AR what was presented in the marketing communication of the key players was not always reflected in reality, at least not yet.

This shift in the work led us to concentrate on delivering a robust work that would work for the broadest constituency of users possible, leading us to refocus on the use of the floating geo-located placards.

8.8 The Aesthetics of Augmentation

As has been argued elsewhere (McGarrigle 2013) AR's ability to overlay real space with a contextual data layer is central to its power as an artistic and activist medium. This epistemological capacity to augment and contest the materiality and understanding of physical space through the introduction of real-time locationally specific instructional, informational, aesthetic, narrative and subversive content is the core of AR's power as an artistic medium. In this work, *Data Narratives*, the audience were presented with a camera view over which a changing selection of data describing their location was overlaid. Each informational placard had a specific geo-location and orientation; thus, appearing relative to each user's position, placards were additionally assigned differing durations once triggered by the app's presence, thus ensuring a dynamic display of information from the range of available perspectives, with the experience being individual to each user and contingent on their physical presence and location. The placards were specific to each neighbourhood providing data relevant to where it was accessed with the display changing from street to street. Depending on viewpoints and position, they were sometimes sparse while in other areas crowded and overlapping with viewpoints competing for attention (Fig. 8.6).

At times, the extent of the data display obscuring the view completely rendering it unreadable as a torrent of only partially comprehended data, while at others, they resolved into clear narratives that were intelligible to the user. While the data displayed in the app were a relatively small data set curated to be representative, once overlayered on to this normal camera view perspective an effect was conveyed of an overwhelming complexity, that in this limited context, the human eye was unable to keep up. Nonetheless, some of the data would register, some impression would be made and a notion of the hybridity of space as an intertwining of both the physical and digital would be presented, however rudimentarily. This is an aesthetic experience that operates at multiple levels; at once, it juxtaposes with our sense experience of everyday life (Saito 2017) with AR reconfiguring our perception of the physical world through visual, graphic, dynamic and conceptual augmentation. However, aesthetics following Rancière can additionally be understood as the 'distribution of the sensible' (Rancière 2009) and thus inherently ethical and political. The aesthetic of *Data Narratives* resonates at this political level that seeks to add to the discourse

Fig. 8.6 Data narratives screen showing overlapping data placards displaying a range of data including Airbnb reviews

on the housing crisis in Ireland in its epicentre, Dublin. It is also a data visualization that seeks to increase engagement with these data sets through novel modes of presentation, and the aesthetics of data visualization also come into play. These aesthetic registers are seen to be complementary of each other, their combination, juxtaposition and interactions in the augmented hybrid space creates the open space of the work to be engaged with by the audience mirroring the competing narratives of the space of the city that are told through myriad data sets.

8.9 Conclusion

Data Narratives is in many ways a prototype, an intervention that points towards a way of working with AR and data, a way of contextualizing space through a process of augmented narrative that has its roots in the work of the locative media movement of the mid-2000s. This chapter has focused on the process of producing the app, from research to technical production and the thought processes that have informed this work. This comes from our background as artists and art educators. As artists we recognise the complexities of working with emerging technologies, where there is often not a clear roadmap for artistic uses of the technologies being deployed. As educators, we understand that the relative difficulties of creating art with a range of tools, platforms and technologies imposes very real practical limitations for our students. With these limitations negatively impacting on the choices they make in their work. While one of the main ambitions of the project was regretfully abandoned when the technology was found lacking, we imagine that this will be possible shortly and will be revisited either by this or a new project. While the

complexities of development were found to be increasingly challenging for artists, certainly in comparison to an earlier generation of AR tools such as Layar, recent advances in browser-based AR libraries such as a AR.js give hope that the next generation of AR will be in the browser, with a lower learning curve and a more open paradigm.

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Chapter 9
Beyond the Virtual Public Square: Ubiquitous Computing and the New Politics of Well-Being

Gregory L. Ulmer and John Craig Freeman

9.1 Introduction

However the public square was once the quintessential place to air grievances, display solidarity, express difference, celebrate similarity, remember, mourn, and reinforce shared values of right and wrong, it is no longer the only anchor for interactions in the public realm. Public discourse has been relocated to a novel space: a virtual space that encourages exploration of mobile location-based art in public. Moreover, public space is now truly open, as artworks can be placed anywhere in the world, without prior permission from government or private authorities—with profound implications for art in the public sphere and the discourse that surrounds it. The early 1990s witnessed the migration of the public sphere from the physical realm, the town square and its print augmentation, to the virtual realm, the Internet. In effect, the location of public discourse and the site of national identity formation have been extended into the virtual world and the global network. Electracy is to digital media what literacy is to print. It encompasses the broader cultural, institutional, pedagogical, and ideological implications inherent in the transition our society is undergoing. Electracy describes the functional metaphysics necessary to exploit the full discursive potential of electronic media such as mobile media, the Internet and augmented (mixed) reality. With the emergence of these technologies on mobile devices, the distributed placefulness of Internet public discourse entertains the possibility of a new global democracy.

Orators, Rostrums, and Propaganda Stands, shown in Fig. 9.1, is based on the work of Gustav Gustavovich Klucis, including his designs for screen-radio orators,

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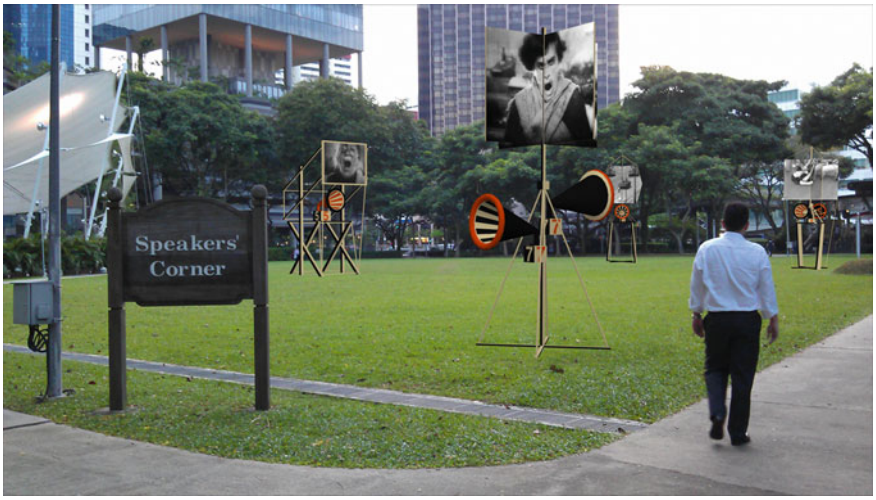

Fig. 9.1 Orators, rostrums, and propaganda stands by John Craig Freeman, Speaker's Square, Singapore, 2013, Augmented reality public art

rostrums, and propaganda stands from 1922. Klucis was a pioneering member of the Russian Constructivist avant-garde in the early twentieth century. As Russian politics degenerated under the Stalin dictatorship in the 1920s and 1930s, Klucis came under increasing pressure to devote his artwork to state propaganda. Despite his loyal service to the Communist Party, Klucis was arrested in Moscow on January 17, 1938. His whereabouts remained a mystery until 1989, when it was discovered that he had been executed by Stalin just after his arrest (Šatskih 2001). Each of the four virtual objects displays a black and white animation from a contemporary mass uprising: Tank Man near Tiananmen Square in Beijing in 1989; the assassination of Neda Agha-Soltan, who was gunned down in the streets of Tehran during the 2009 Iranian election protests; scenes from Tahrir Square in Cairo during the 2011 Arab Spring; and the 2011 Occupy Wall Street uprising. Each of these images is juxtaposed, in montage, with frames from the Odessa Steps scene of Sergei Eisenstein's historic *Battleship Potemkin* film. When touched, the virtual objects play sound from the uprising. The stands call up both the resurgence and nostalgia of current worldwide political idealism as they reimagine the public square, now augmented with the worldwide digital network.

9.2 Ubimage

The works included here are a sample of experiments testing a consulting practice (konsult) native to electracy (the digital apparatus). The consultations reference the EmerAgency, a virtual "egency," promoting a fifth estate for a global public sphere.

The genre of konsult applies Arts & Letters knowledge and methods to policy formation controversies, with the purpose of giving social media an independent means for a collective voice with which to address governments, corporations, and entertainment entities. One premise of the experiments is that an apparatus is a social machine. Its invention includes not only technologies, but also authoring practices within new institutional support, and identity experience and behavior of individuals and groups (Ulmer 2003).

The technology of augmented (mixed) reality, ubiquitous pervasive computing (mobile locative media), when considered within the full apparatus of electracy, constitutes *ubimage*. It assumes a vision of technics on a trajectory of innovation of which the current emblem is Google Glass: the prospect of a physical and cultural environment in which there is a convergence and syncretism of total real-time information (Internet) with the present lifeworld (Lebenswelt). This convergence exists first as a juxtaposition or superimposition, with a host of emerging practices attempting a suture. Apparatus history shows that the invention of authoring practices has its own sources apart from the evolution of technics.

9.3 Apparatus

The electrate apparatus is invented in three registers: technology, compositional practices, and identity formation. The saturation of everyday environments with mobile devices encountering sensor settings is the contribution of technics. Interactive equipment establishes at the level of technics a feature of the world central to the history of the arts, which materialize and augment a human capacity to be affected by place and event. Marcel Proust's involuntary memory triggered by the taste of a tea biscuit (Proust 2006) or the Wolf Man (Freud 1963), whose obsessions were triggered by the site of a maid scrubbing the floor, are two famous examples of embodied triggers, emblematic of this capacity. Ubimage is a logic of *catalysis*, just as literate dialectic is a logic of analysis.

A primary focalizer for the responsibilities of konsult is Paul Virilio and his warnings about the General Accident (Virilio 1997) and more conventionally the historical fact that every invention comes with a gift cause (extending Aristotle's four causes beyond intentionality: material, formal, efficient, final) (Falcon 2012). Gift cause is the unintended inevitable accident associated with every invention. What is the accident potential of ubicomp? It is worth remembering that Heidegger anticipated Virilio's warnings in saying that catastrophe is inherent in being. Those YouTube videos showing "funniest home video" moments of smartphoner accidents reenact one of the founding events of philosophy (Thales fell into a ditch while gazing at the stars). "The actively violent one, the creator, who moves out into the un-said, breaks into the un-thought, who compels the unhappened and makes the unseen appear, and this actively violent one stands at all times in peril. In risking a prevailing over being, he must take a risk with regard to the onrush of non-being,

with regard to disintegration, un-constancy, and lack of structural order and disorder" (Heidegger 2000).

Heidegger's account foregrounds the "violence" of creative invention that produces both human prevailing against the overwhelming (nature) and also catastrophe (the lesson of tragedy in general). His insight is that aporia is an irreducible dimension of poros. These experiments register this complexity: a/poria, im/mobility, and no/way. Ubimage for well-being is a practice of a/poria (im/mobile media).

Border Memorial: Frontera de los Muertos, shown in Fig. 9.2, is an augmented reality public art project and memorial, dedicated to the thousands of migrant workers who have died along the US/Mexico border in recent years trying to cross the desert southwest in search of work and a better life. This project allows people to visualize the scope of the loss of life by marking each location where human remains have been recovered. Based on a traditional form of wood carving from Oaxaca, the virtual object consists of life sized, three-dimensional geometric models of a skeleton effigy or calaca. Calacas are used in commemoration of lost loved ones during the Mexican Día de los Muertos, or Day of the Dead festivals. According to indigenous belief, despite the tragedy, death should always be celebrated (Holmer 2005). In the tradition of Día de los Muertos, the Border Memorial project is designed to honor, celebrate, and remember those who have died and to vault this issue into public consciousness and American political debate. The project is intended to provide a kind of lasting iconic presence in an otherwise ephemeral physical environment and cultural discourse.

Fig. 9.2 *Border Memorial: Frontera de los Muertos* by John Craig Freeman, On the road to Ajo along Highway 86, Arizona, 2013, Augmented reality public art

9.4 Theoria

This sample of works retrieves the institution of theoria, as practiced in the ancient world—a combination of tourism and theory. The most famous example of theoria is the visit of the three Wise Men to the manger in Bethlehem, to determine the truth of the rumors that a new king was born. A theoros (member of a theoria) is sage, someone like Solon for the Classical Greeks, a person trusted by the community, dispatched to sort out fact from fiction in the information flow of a community (Plato 2006a). Theoria toured a situation, consulted with locals who served as guides to all the shrines, sites, and important personages of the area. The theoria announced its findings *in the public square of its home city*, and these findings constituted what was the case. Aristotle's invention of metaphysics began with the *categories*, as if codifying in grammar the declarative form that may be determined as either true or false, for making trustworthy statements in the service of the Polis. A version of his categories survives today in traditional journalism (the five Ws, beginning with "What?").

Ubimage makes possible a new dimension of consulting, triangulating between the present institution of tourism (a vital contemporary vernacular behavior, largest single industry in the world), and the historical practice of divination (tarot, for example, mapping the universal journey through life for pre-modern people). Divination was an essential part of traditional deliberative reason, concerned with decision-making to influence future conditions. It was a faculty for processing the future, just as memory is a faculty for processing the past. Both tourism and divination model a certain functionality to be appropriated by ubimage. Tourism orients GPS (physical mobility), and divination orients EPS—Existential Positioning System (metaphysical mobility). The retrieval of these registers of theoria for konsult calls attention to the contradiction of contemporary media: Enthusiasm for mobile computing masks the metaphysical immobility of modernity, the fundamental aporias that arrest policy decisions on behalf of well-being at every turn (trope). The global city remains as paralyzed as it was when its labyrinth was first surveyed by modernist arts and philosophy. The era of electracy begins in the industrial city.

Tarot and the I Ching are especially misunderstood, due to caricature survivals in New Age and self-help contexts. These popular, vernacular practices, nonetheless, are a resource for invention in that they provide a background tradition of popular decision-making. The fifth estate via social media is crowd-sourced self-help democracy. Greek philosophy (literate metaphysics) was not invented from scratch, but was generated in the new educational institution—the Academy—as a syncretism and refinement of cultural features of the contemporary society, including the oral culture of spoken Greek. Tarot was created in Renaissance Italy and is a popular expression of the same forces shaping the work of the Neoplatonic Academy in Florence. It acquired most of its hermetic aspects in the same environment nurturing the birth of the avant-garde arts in Paris in the nineteenth century, and the commentaries bringing it most fully into contact with contemporary thought are found in psychoanalysis.

Psychoanalysis, in its cultural productivity, is divination, repurposed as a new logic mapping the vicissitudes of enjoyment.

Gregory Bateson identified the keywords of the oral and literate apparatuses in his book *Mind and Nature* (Bateson 2002). Reality in the oral apparatus (extended via Religion into the present) is organized by the principles of *salvation* (spiritual transcendence). Reality in the literate apparatus (extended via science into the present) is organized by the principles of *entropy* (material immanence). Bateson does not address electracy, but the twin realities of salvation and entropy suggest why a third option is desirable. Reality in the electrate apparatus (with the effect of reordering the other institutions) is organized around *well-being*—the problematic of happiness, recently entering public policy in the form of hedonics. At present, this organization is emergent within entertainment, commercial and commodity forms, and the institutionalization of aesthetics. As Kant argued in promoting aesthetic taste to equal status with Pure and Practical Reason in his third critique, the function of judgments of beauty and the sublime was to bridge the abyss separating nature's necessity and human freedom (Kant 1951).

Flotsam is floating wreckage of a ship or its cargo. Jetsam is part of a ship, its equipment, or its cargo that is purposefully cast overboard or jettisoned to lighten the load in time of distress and that sinks or is washed ashore by the Coriolis effect: planetary vorticity along with horizontal and vertical friction. Marking the contour of the expected sea level 50 years from now, *Flotsam & Jetsam*, shown in Fig. 9.3, is a clarion call for the denizens of the world to take seriously the science of climate change and other abuses to the global environment by envisioning the debris left by storm surge and other manifestations of the incoming tide.

Fig. 9.3 *Flotsam and Jetsam* by John Craig Freeman, Singapore, 2013, Augmented reality public art

9.5 The Malala Test

What is at stake in this syncretizing ambition for the arts in electracy may be seen in the irreducible hostility between religion and science currently plaguing civilization. We must appreciate that this confrontation is between not just institutions, but entire apparati. Any number of incidents might represent the impasse for our time, as the confrontation between Galileo and the Church did for Bertolt Brecht. A radical Islamist group in Nigeria calling itself "Boko Haram" (meaning "Western Education is Sacrilege"), burned down a school in Nigeria, killing 29 students and an English teacher. The Khmer Rouge included in its genocide anyone wearing glasses, a shibboleth signaling "intellectual." Konsult takes the side of Malala Yousafzai against her Taliban would-be assassins: "One child, one teacher, one book, one pen can change the world," she declared, in demanding the right to education for everyone. Ubimage takes up again the old struggle between pens and swords, to demand that religion and science correlate with well-being.

A caveat to avoid melodramatic oversimplifications of the test is found in another version of the opposition: Jihad vs. McWorld. Is Las Vegas the best electracy can do in promoting the good life? Each apparatus has its own version of fair and foul. What if obesity fell into the wrong hands? The challenge of ubimage is to extrapolate from the inventions of corporate entertainment (the leading edge of electrate institution formation) the means of metaphysical innovation that transforms the conflict of civilizations into a correlation of apparati. What in fact constitutes well-being? Aristotle said it was happiness, accomplished through the good, but these transcendental terms could only be defined within a Polis, a political community, since they were not given as actual, but only as potential. The fifth estate (ubiquitous democracy) is this Polis. An immediate goal of konsult is to develop a practice to support community institutionalization of well-being outside merely commercial values (Bataille's restricted economy) (Bataille 1991), but also apart from the restrictions of religion and science. The short-term goal of the present experiments is to understand and undergo for ourselves the basic insight into well-being expressed in Arts & Letters tradition, as a first step toward designing a practice for general electracy.

The convergence of Internet and lifeworld producing an ecology of information creates a need and opportunity to develop a contemporary version of the microcosm–macrocosm correspondences enjoyed by pre-modern civilizations. The systems of correspondences organizing divination that oriented individuals to the ethos and habitus of society were destroyed by modernity (scientific industrialized utilitarian society). The program for a new "correspondence" (Baudelaire's "forest of symbols" (Baudelaire 1994), Walter Benjamin's Arcades allegory (Benjamin 1999)) concerns the functionality modeled in oracles such as Tarot or the I Ching, if not the cultural content of those systems. Oracle "games" allow individuals to author epiphanies, and the epiphany form survived in modernist poetry and art in the absence of the system that supplied data from the wisdom traditions in support of practical reason (decision procedures). The experiments undertaken in ubimage design and test a contemporary practice of correspondences, constructing a system of macro–microcosmos for

an electrate wisdom. Ubimage is a practice of "macroimaging" (arts equivalent of macroeconomics, each dealing with the dynamics of information circulation).

9.6 Obscenario

The obscenario is a transitional alternative to the *scenarios* of conventional consulting, as a means to imagine the future in order to decide policy in a flash. Concepts are literate, and the purpose of philosophy, according to Deleuze and Guattari, is to create concepts (Deleuze and Guattari 1994). Transition from literacy to electracy requires learning how to extend conceptual thinking within electrate media, in order to imagine our way into the new apparatus. Deleuze and Guattari analyzed "concept" into three components: an idea (term), a problem field addressed by the idea, and a conceptual persona who dramatizes the import of the idea in a situation. Obscenario shifts the emphasis from literate foregrounding of the eidos (abstract configuration of properties) to persona in a situation, which lends itself to imaging. The prototype of a conceptual persona is Socrates, dramatizing "dialectic" as idea in the dialogs of Plato. We rely on this analogy to move into the invention of a postliterate practice: an avatar of concept. The phrase is ambiguous: the concept of "avatar" and an avatar of "concept" (which itself may not appear). The first step, in other words, is to develop within literate skills a concept adequate to the invention of konsult: a practice that does for electracy what the dialog did for literacy.

The relay from Socrates is useful to identify the features of obscenario. There are several levels for emulation: (1) Plato creates the dialog as a device to communicate in writing the new logic of dialectic. Students are introduced to dialectic (analysis and synthesis) through an interface metaphor, the behavior of the gadfly Socrates. Dialog as pedagogy requires a certain attitude: a commitment among friends to suspend competition in order to discover what is objectively (logically) true; (2) the scenario proper is Socrates encountering an interlocutor on the streets of Athens, in everyday life, as in *Euthyphro*, for example (Plato 2006b). Euthyphro is in a situation: He has decided to prosecute his father for impiety. Socrates asks Euthyphro to define his terms: What does he mean by "impiety"? Of course to define a term produces a concept—a literate skill, but Euthyphro is illiterate; (3) the context for the apparatus is the invention of practices of logic to augment pure reason, as a capacity of selfhood (individual identity) in a democratic state (collective identity). The instruction is to extrapolate to our own case.

Concept avatar is not dialog or dialectic, but uses those to generate an electrate equivalent, to do for EmerAgency konsult what dialog did for Plato's Academy. The capacity to be addressed, supported, and augmented in konsult via ubimage is not reason (logic), but affects, sensory perception (aesthetics). The medium (equipment) is not alphabetic writing, but ubiquitous computing (pervasive computing: mobile devices in smart environments). Euthyphro in the midst of a situation encountered in the streets of Athens the gadfly Socrates. Egent (intern of EmerAgency) consulting

Fig. 9.4 *EEG AR: Things We Have Lost* by John Craig Freeman, Liverpool, 2013, Augmented reality public art

(testifying) on public policy encounters, via smart device in an intelligent environment, avatar. The experiments collected here are traces of avatar. Who is addressee of konsult? First, it is the egent and her network (self-addressed, middle voice). Ubimage is not a spectacle, but a distributed gadfly.

EEG AR: Things We Have Lost, shown in Fig. 9.4, allows participants to conjure up virtual objects by simply imagining them into existence using brainwave sensor technology. As part of the research, development, and community engagement of this project, in 2012 we selected people at random in the streets of Liverpool and simply asked "What have you lost?". The location was recorded, a virtual lost object was created based on the response, and the objects were then placed back in the exact GPS coordinates using augmented reality technology, creating a citywide network of lost things. Through this process, a database of lost things was generated, including pensions, empires, dodo birds, etc. During the experimental phase of the project, test subjects were outfitted with EEG-reading brainwave sensors and asked to think deeply about what he or she has lost. Once our software detects a measurable and consistent pattern, it issues a database call to instantiate a virtual lost object at random from the database. The virtual object then appears in front of the participant, viewable on any iPhone or Android device.

9.7 Ordinary Aura

The Socratic Dialog as a relay for concept avatar clarifies in the hypotyposis (proportional analogy) that konsult foregrounds not critical reason but perceptual affect (see

also the three registers of Deleuze and Guattari: Science, Philosophy, Arts—fact, concept, affect-percept). The challenge of ubimage is to design a practice capable of work-play with all three orders at once in the context of a situation. Such is the skill-set of electracy. The exercise testing concept avatar (the thought of feeling) takes up the imperative of the avant-garde, championed in many forms subsequently—to merge art with everyday life. The terminology calls attention to the specific target of ubimage relative to apparatus theory. The STEM engineers, as they say, have saturated the everyday world (*Lebenswelt)* with equipment (mobile devices networking with sensors in smart environments). That takes care of technics, but the commentary tends to assume that everyday life is unproblematic, which is far from the case. In fact, the everyday is a major topic of discipline interest, as for example in the philosophy of Henri Lefebvre (Lefebvre 1992), taken up in Situationism, Guy Debord (Debord 1994), not to mention Walter Benjamin's Arcades Project (Benjamin 1999), and the Frankfurt School focus on the problem of alienation as the impoverishment of everyday life experience.

Specifically, the parallel with digital convergence and saturation is the integration of the aesthetic attitude into lifeworld behavior and skills. Here is a key to the electrate apparatus in general: It emerges into metaphysics through the aesthetic attitude, just as literacy as science required the frame of curiosity in order to thrive. The invention of an "attitude" is part of apparatus formation. "Aesthetics" introduces a certain "distance" into experience, termed "aura" by Benjamin. It is important to clarify that the devotion to "pure art" (art for art's sake) during the initial period of electracy in nineteenth-century Paris (Parisian Bohemia in Montmartre cabarets is the electrate equivalent of the Athenian academies creating a space for pure reason) was inventive, a necessary concentration for articulation of art as "logic," prior to dissemination as general cultural interface (GCI) for an electrate civilization. The point is that netizens (ubizens) via the apparatus are able to include aura not as separation from but syncretic with their other institutional behaviors—work, family, and leisure. Aura (aesthetic attitude) *creates value*, which recommends it as the means to overcome alienation and recover experience of individual and collective agency, which is the avatar function. The insight is that well-being refers to specific values, whose aesthetic character can and should be realized through public policy. "Being a dynamic principle, the aesthetic function is potentially unlimited; 'it can accompany every human act, and every object can manifest it.' Its limit lies in the fact that it derives from the dialectical negation of a practical or communicative function. And because the phenomena it produces in the constant renewal of the aesthetic experience are subject to societal judgment, i.e., must find public recognition before they can enter the tradition-creating process as aesthetic norms, there is a second, intersubjective limitation. In contrast to Roman Jacobson's earlier definition of the poetic influence of language, the aesthetic function is not self-referential for Mukarovsky, it is more than a statement oriented toward expression for its own sake. Because the aesthetic function changes everything that it touches into a sign, it becomes transparent for the thing or activity that it "sets aside some practical association." Precisely because the aesthetic function differs from all others (the noetic, the political, the pedagogic) in having no "concrete aim" and because it lacks "unequivocal content,"

Fig. 9.5 *Water wARs* by John Craig Freeman, Beneath the Brooklyn Bridge, New York, 2011, Augmented reality public art

it can take hold of the contents of other functions and give their expression the most effective form" (Jauss 1982).

Such is the attitude native to electracy. What the spiritual is to orality and the materialist to literacy, the aesthetic is to electracy.

Water wARs, shown in Fig. 9.5, anticipates the flood of environmental refugees into the developed world caused by environmental degradation, global warming, and the privatization of the world's drinking water supply by multinational corporations like Bechtel. The project consists of a sprawling virtual shanty pavilion for undocumented artists/squatters and water war refugees.

9.8 Choragraphy

Konsult is a practice to correlate existential experience with everyday life materiality. For an environment to be intelligent, the apparatus needs to manage not only physical location (GPS), but EPS, which requires tracking not only presence but absence (*différance*) (Derrida 1998). If conventional wayfinding gives coordinates that say "You Are Here," existential coordinates engage a more complex orientation: *You are where you are not, and are not where you are.* A konsult is an event of encounter between egents and places, both of which involve dimensions that are not phenomenal, not present, without presence and not presentable. Such are the coordinates mapped through ubimage. Thoreau's *Walden* concludes with a figure that provides an emblem for EPS: "What was the meaning of that South-Sea Exploring Expedition, with all its parade and expense, but an indirect recognition of the fact that there are

continents and seas in the moral world to which every man is an isthmus or an inlet, yet unexplored by him, but that it is easier to sail many 1,000 miles through cold and storm and cannibals, in a government ship, with 500 men and boys to assist one, than it is to explore the private sea, the Atlantic and Pacific Ocean of one's being alone" (Thoreau 1992).

Choragraphy as ontological mapping takes up this question of coordinating material and spiritual wayfinding, exploring the shifting borders and thresholds between inner and outer well-being.

Thoreau's passage is emblematic because it uses global exploration and mapping as a metaphor for self-knowledge. The challenge of EPS choragraphy is that the space–time for which it is responsible is a second-order construction, figurative rather than literal, emerging through aesthetic formal manipulation of media. But the promise of ubimage is to create an interface convergence of literal and figurative dimensions of human experience.

Clive James gives an idea of the nature of figuration that renders intelligible the non-phenomenal dimension absent from all maps. "Any poem that does not just slide past us like all those thousands of others usually has an ignition point for our attention. To take the most startling possible example, think of "Spring," by Gerard Manley Hopkins. Everyone knows the first line because everyone knows the poem. "Nothing is so beautiful as Spring" is a line that hundreds of poets could have written, and was probably designed to sound that way. Only two lines further on, however, we get "Thrush's eggs look little low heavens" and we are electrified. Eventually we see that the complete poem is fitting in its every part, for its task of living up to the standards of thought and perception set by that single flash of illumination. But we wouldn't even be checking up if we had not been put on the alert by a lightning strike of an idea that goes beyond thought and perception and into the area of metaphorical transformation that a poem demands. A poem … is dependent on this ability to project you into a reality so drastically rearranged that it makes your hair fizz even when it looks exactly like itself" (James 2008).

Poetry is a guide for how to introduce an ignition point into public space. Two aspects of James's description are worth noting in our context: the figure of electrification and the lightning strike of an image, resonant with electracy and flash reason; that the version of reality made receivable through aesthetic indirection is—like Plato's metaphysical dimension of chora, the interface between being and becoming—beyond both thought and perception.

Tiananmen SquARed, shown in Fig. 9.6, is a two-part augmented reality public art project and memorial, dedicated human rights and democracy worldwide. The project includes virtual replicas of the Goddess of Democracy and Tank Man from the 1989 student uprising in Tiananmen Square. Both augmentations have been placed in Beijing at the precise GPS coordinates where the original incidents took place. The Goddess of Democracy was a 33-foot tall statue, constructed in only 4 days out of foam and papier-mâché over a metal armature. Students from an art institute created the statue, placing it to face toward a huge picture of the late Communist Party chairman Mao Zedong. Tanks later flattened the statue when China's military crushed the protest. Tank Man was an anonymous man who stood in front of a column

Fig. 9.6 *Tiananmen SquARed* by four gentlemen, Tiananmen Square, Beijing, 2010, Augmented reality public art

of Chinese Type 59 tanks the morning after the Chinese military forcibly removed protestors from in and around Beijing's Tiananmen Square on June 5, 1989. The man achieved widespread international recognition due to the videotape and photographs taken of the incident.

9.9 Aesthetic Attitude

Konsult includes aesthetic attitude in the public sphere, to exercise and enhance capacity to be affected. The attitude is modeled in several areas of common experience: tourism, movies, arts, and crafts. Konsult applies the vanguard project of merging art with everyday life, not to make art, but to put the stamp of being on becoming. Moment against dromosphere in any case attempts praxis as poiesis. It is possible through ubimage to syncretize in one performance the three intellectual virtues—an *act recorded as image of political import that produces understanding for an egent*: Achilles, Pericles, and Homer in one. Despite his existentialist credentials, Sartre was wrong (Sartre 2013): It is possible to live and tell (at least in electracy). Such acts constitute the distributed egency of a fifth estate in a global public sphere.

Orhan Pamuk, in his novel *Snow*, tells the story of Ka, an exiled poet who returns to Turkey to report on a wave of suicides, and also to reconnect with a woman he had loved in his youth. He has not written any poetry in a number of years. But during the events of his visit, the old creative capacity returns, at least briefly, and he is able to write a poem. The example is relevant to us not for the poem, but for how the feelings of significance arise in the midst of a situation, pursuing both professional

and personal projects, while reflecting on the meaning and purpose of his life. The immediate instructions may be derived from the gradual dawning of inspiration as the circumstances of recent incidents begin to form into a system of correspondences producing epiphany.

"He made his way along the train track, past the snow-covered silo that loomed overhead like a great white cloud, and was soon back inside the station. As he passed through the empty, dirty building, he saw a dog approaching, wagging its curly tail in a friendly way. It was a black dog with a round white patch on its forehead. As he looked across the filthy waiting hall, Ka saw three teenage boys, who were beckoning the dog with sesame rolls.

There was a long silence. A feeling of peace rose up inside Ka. They were so far from the center of the world, one couldn't even imagine going there, and as he fell under the spell of the snowflakes that seemed to hang in the sky outside, he began to wonder if he had entered a world without gravity. When everyone had ceased to pay any attention to him, another poem came to Ka.

The poem was made up of many of the thoughts that had come to him all at once a short while earlier: the falling snow, cemeteries, the black dog running happily around the station building, an assortment of childhood memories, and the image that had lured him back to the hotel: Ipek. How happy it made him just to imagine her face—and also how terrified! He called the poem "Snow."

Much later when he thought about how he'd written this poem, he had a vision of a snowflake; this snowflake, he decided, was his life writ small; the poem that had unlocked the meaning of his life, he now saw sitting at its center. But—just as the poem itself defies easy explanation—it is difficult to say how much he decided at that moment and how much of his life was determined by the hidden symmetries this book is seeking to unveil. Before finishing the poem, Ka went silently to the window and watched the scene outside: the large snowflakes floating so elegantly through the air. He had the feeling that simply by watching the snow fall he would be able to bring the poem to its predetermined end" (Pamuk 2005).

The relay for ubimage is that becoming poem occurs in the midst of life experience, and that it makes itself known through augmented perception, memory, imagination, feeling–an emotional intensification associated with revelation. This dimension of ordinary moments in everyday life is the one opened to ontological construction of well-being in electracy. Ubimage is a practice for accomplishing these events, distributed through konsult, to gather an army for well-being through an intensity of shared feeling.

With nine locations along the Peace Line in West Belfast, *Peace Doors*, shown in Fig. 9.7, addresses the ongoing conflict between the Catholic and Protestant communities there. The Peace Line is constructed of walls, fences, industrial complexes, and even a shopping mall, designed to separate the Protestant Shankill neighborhood to the north from the Catholic Falls Road neighborhood to the south. The first Peace Line barriers were built in 1969, following the outbreak of the Northern Ireland riots and "The Troubles." They were built as temporary structures because they were indeed meant to be temporary, lasting only 6 months, but due to their effective nature they have become more permanent, wider, and longer across the city.

Fig. 9.7 *Peace Doors* by John Craig Freeman, Along the Peace Line, West Belfast, 2010, Augmented reality public art

9.10 Rationale

Here is an outline of the logic motivating this collection of experiments.

I. Dromosphere

- Frame: Konsult proposes a practice of citizen participation adequate to the conditions of the dromosphere (dimension collapse) theorized by Paul Virilio. Virilio argues convincingly that the light speed of the digital apparatus has made possible (inevitable) a General Accident that occurs everywhere simultaneously.
- Dimension pollution compresses time–space into now, challenging literate formations of individual critical thinking and the democratic public sphere. This challenge is the crisis alluded to in the name of the consultancy—EmerAgency, whose motto is: "Problems B Us." Dromos (race) consists of three positions (moments, opportunities, openings): start, turn, and finish. Konsult practices *Turn* (trope).

II. Prudence

- Konsult draws upon the experience of Arts and Letters traditions with immediate intuitive judgment to formulate *flash reason* as the logic needed for deliberation (community decision-making) in the dromosphere.
- Prudence (Aristotle's *phronesis*) is the virtue of good judgment. A person with good judgment is able (*posse*)—in the midst of an ongoing situation—to draw upon past experience to make the right decision about how to act that brings about the best outcome for the community. In oral culture, this

kind of judgment on the fly was associated with *metis*, a skill of *savoir-faire* demonstrated in its purest style in the conduct of a race.

- *Kairos* is the mode of temporality proper to metis (the term refers to the weaver's art of throwing the shuttle at just the right moment). Kairotic time displaces cyclical (oral) and linear (literate) models of time to become the primary temporality in electracy.

III. Flash Reason

- The lightning flash of insight (intuition, inspiration) has been fully theorized in Western thought, especially with respect to moment (*Augenblick*). Moment is taken up in konsult as the answer to now crisis. Sudden thought draws together all human faculties to take in a situation in one (augmented) glance. The limits of this glance relative to the human sensorium are codified as "beauty," however that experience may be understood in a given culture. The invention of aesthetics as a separate faculty at the beginnings of electracy (Kant et al.) recognized and anticipated the challenge to moment in the notion of the sublime. The conditions of the industrial city are sublime, producing shock experience of alienation, reification, objectification, in which denizens lose connection with agency (with the categories of experience: space, time, cause).
- The arts take up the dynamics of moment, focusing on a poetics of epiphany. Epiphany (secularized revelation) is the formal structure of flash reason, transformed in Romanticism (German Idealism) as the "crisis poem" (Harold Bloom), reconfiguring the operations of allegory and symbol, promoting tropology as supplement of inference and narrative as primary skills of the cultural interface. The project evolved across the arts, leading to a new structural mode of correspondences addressing the disjunction of microcosm/macrocosm in the city.
- Relevant versions of epiphany include Baudelaire's correspondences, Rimbaud's illuminations, Rilke's world-inner-space, Eliot's objective correlative. Proust (involuntary memory), and Joyce (epiphany) extended the function to the novel, as did Brecht (gestus, V [A] effect) and Artaud (cruelty) in theater. Freud's transference, Benjamin's dialectical image, and Merleau-Ponty's flesh are key instances of theoretical elaboration of flash reason.

IV. Mechanical Reproduction

- Manifesting a certain (happy) correlation across the levels of the apparatus, the invention of photography makes available one of the new supports of communication displacing alphabetic writing in the electrate economy. Photography was just the first in a series of major innovations lending technological augmentation to the sensorium, continuing today in digital computing (Web 3.0). Smartphones equip the sensorium for sublime conditions. The filmic shot is kairotic. The insight of apparatus theory is that a

general electracy must be developed as institution and practice to coordinate digital equipment with flash reason.

- The aesthetics of moment was formulated in photography by Henri Cartier-Bresson's "decisive moment" (shooting *a la sauvette*). This design principle has a long history in the visual arts, with painters choosing the telling instance of an action to lend a narrative dimension to a picture. The principle reaches its theoretical completion in Gestalt psychology and phenomenology—the principle of *Prägnanz*: the combination of expectation and perception to produce default continuities or groupings in experience. Gestalt manifests the limitations of glance, inadequate to dromospheric sublime that becomes formless (information sprawl).
- Avant-garde poetics invented during this same period (nineteenth-century Paris), whose prototype is Duchamp's ready-mades, such as "Fountain," extended Kant's judgment to include the automatism of the snapshot. Chance as a formal device, coordinated with recording equipment and flash poetics, was integrated in support of a new attitude toward everyday life, beyond both knowledge and will (the constitutive stands of Pure and Practical Reason).
- Theoretical complements of vanguard poetics include Georges Bataille's *informe* (formless), Deleuze and Guattari's rhizome (swarm), Lacan's stain, and related engagements with sprawl complexity.

After the 2007 shootings at Virginia Tech, you may remember the commentary that was published in the New Yorker, about the heartbreaking experience of the police carrying the bodies out of the classrooms while the cell phones in the victim's pockets and backpacks kept ringing. *School Shootings eMorial*, shown in Fig. 9.8, consists of an of augmented reality scene including a virtual replica of the Sandy Hook School sign, 20 backpacks representing each of the students and six apples representing each of the teachers and staff who lost their life in the Sandy Hook Elementary School shooting in Connecticut on December 14, 2012. When people approach the backpacks, cell phone ringing sounds are triggered.

9.11 Quasi-object

Ubiquitous imaging—ubimage signifies within a digitally supported logic in the apparatus of electracy. There is a backpack (for example), an object ubiquitous as a commodity, a quasi-object (extimate entity, simulacrum) circulating for its use and exchange value, becoming signifier. Follow the trace (inference path): Cell phones were heard ringing in the backpacks of students murdered at Virginia Tech (04/16/2007). The backpacks of the children slaughtered at Sandy Hook Elementary School in Newtown, CT (12/14/2012), were designed for the imaginations of 6-year-olds, perhaps already beyond the whimsy of Dora the Explorer and her backpack friend. Backpacks were the disguise of choice by the Chechen brothers for the

Fig. 9.8 *School Shootings eMorial* by John Craig Freeman with Gregory L. Ulmer, National Mall just west of the U.S. Capital Building, Washington DC, 2013, Augmented reality public art

IEDs targeting the Boston Marathon finish line, detonated by a connection between a cell phone and a toy car (04/15/2013). Chechen separatists took hostage 1,100 people (777 children) at a school in Beslan, Russian Federation (09/01/2004). Of the 334 killed in the 3-day siege, 186 were children. There is a certain inference trace passing through these events, bringing into appearance an opposition, a fundamental violence, archetypal, an irreducible polarity throwing apart two apparatuses—oral and alphabetic, religion and science. The emblem is made explicit in the name of a group responsible for burning down a school in Nigeria, murdering 29 students and a teacher (07/06/2013): *Boko Haram*, *The classroom as Frontier*. Recall the Khmer Rouge, the genocide of the killing fields of Cambodia (1975–1978, 1.7 million dead), in which anyone suspected of being educated was murdered. Is there a pattern gathering this path into a pathology? Is the Reign of Terror native to modernity (France 09/05/1793–07/28/1794): the guillotine (16,594 executions)? An eMorial translates one-at-a-time disasters into a public sacrifice on behalf of a national value. In the USA from 1960 to 2013, 1.3 million Americans have died from gun violence. These dead are commemorated today, martyrs to the Second Amendment to the Constitution, honored as members of a Minute Man Militia (three Americans killed each and every hour, each and every day). A society is measured by what it values.

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Chapter 10
Augmenting Environmental Graphics in Healthcare Spaces

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10.1 Introduction

The design of healthcare environments has a long and varied history. Recently completed projects suggest we have moved a long way from the mid-twentieth-century image of the hospital with its clinical whitewashed or 'hospital green' walls, fluorescent lights, and linoleum floors. This stark twentieth-century image of healthcare environments—driven by thinking around infection control imperatives—has more recently shifted to take into account the importance of creating more humanistic healthcare environments (Bates 2018). As part of this more holistic thinking, the interior design of modern healthcare spaces sees wall spaces decorated with graphical patterns and images of nature that complement biophilic architectural forms and materials. These spaces are designed to have calming and restorative influence on the broad cross section of communities that pass through our public and private healthcare buildings (Thompson et al. 2012).

There is much discussion about what the future workplace environment will look like, and the promise of ubiquitous, distributed digital media is beginning to gain more

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traction in our collective visioning. As enabling technologies mature, the concept of 'everything, everywhere, all the time', the full potential of distributed screen media and the Internet of Things (IoT) is taking up residency in the public psyche. As we enter the age of 'digital health', it is somewhat ironic that the application and mass adoption of QR code technology (invented back in 1994), as a conduit between a physical and a digital context, might be one of the few benefits of the COVID pandemic. Publics at large have become accustomed to the idea that a printed symbol might be a gateway to digital content. Content that was once seen to live in a different realm from our day-to-day experiences can now be accessed not just in formal workplace or home entertainment settings, but also in public, health care, and leisure spaces. The COVID check-in QR code has made the link between our physical and digital worlds more demonstrable and more public, by offering integrated and located access to digital content.

What then if we take the visual signs symbols and graphical images of modern healthcare interiors and consciously invite people to engage digitally with these forms? Rather than simply experiencing their impact as a visual stimulus, we can also think about these symbols and graphical images as a gateway to digital information, ideas, and stories. In this chapter, we begin to consider how these hybrid digital-physical content forms might be used in a hospital context, a physical environment that is already highly charged with emotion, complexity, action, and activity. We start the conversation by introducing some foundational theories and key terms that support this idea, before stepping through a design experiment that begins to explore the potential of AR Environmental Graphics.

10.2 Placemaking in Healthcare Environments

In recent years, there has been a shift in the thinking of many healthcare providers nationally and internationally towards a focus on a 'patient-centred care' approach in managing patients with different health-related conditions (MacDonald 2014; Nielsen et al. 2017; Ullán and Belver 2021). Patient-centred care is founded upon treating patients as individuals and involving them in decision making about their health where possible (Stewart 2001). A patient-centred care approach is concerned with providing high-quality health services that prioritise patient experiences in the design of services, spaces, and systems. The physical environments within which patient-centred care is delivered are therefore important. One of the ways patient-centred care can be promoted in interior spaces is through the use of Environmental Graphic Design (EGD) (Balkac and Ergun 2018). EGD can be integrated into interior architecture, or be applied through illustration, infographics, and digital display technologies.

The ubiquity of the mid-twentieth-century hospital largely established the hospital as a neutral, sterile platform upon which 'health' could be delivered often downplaying the role of design in the healthcare environment. But this was not always the case. From the late eighteenth century through until the early part of the twentieth

century, the design of physical environments was inextricably linked with the care being provided. From the use of sunlight for infection control in the Nightingale Ward, to the importance of natural ventilation in the sanatorium for Tuberculosis, design was a foundational part of healthcare environments (Collins 2020). The replacement of the bespoke and vernacular with the generic eventually led to the observation that these spaces were having a negative impact on people's health. One of the early places where this was explored was in the field of Environmental Enrichment.

10.2.1 Environmental Enrichment

Environmental Enrichment was first proposed in neuroscience in the 1940s (Hebb 1949). Environmental Enrichment describes the process of adding stimulating features to physical environments in order to stimulate the brain and build neuroplasticity (McDonald et al. 2018). Early experiments used animal models to show that replacing artificially bland environments with more stimulating environments resembling the natural world could enhance brain function (Würbel 2001). More recently, the creation of visually interesting environments in spaces that are perceived as boring or under-stimulating has been shown to be beneficial to people who spend long periods in these environments. This includes lengthy stays in hospital or even long delays in waiting rooms (McDonald et al. 2018). Suggesting that under-stimulating environments can have a negative rather than simply neutral impact on people's health and wellbeing. It has also been hypothesised that Environmental Enrichment may help to reduce stress and improve mental health in a wide range of physical environments, including workplaces (Morichetto and Nilsson 2021).

Environmental Enrichment highlights the importance of our indoor environments and links environmental quality with physiological changes that can affect our wellbeing. However, the neuroscience focus of this discipline lends itself to a focus on rebuilding capacity following brain injury because it allows a targeted intervention based on an assessment of decline. Deciding on the kinds of stimulation we should be exposing 'healthy' people to is more challenging.

10.2.2 Environmental Graphic Design

Environmental Graphic Design (EGD) is an interdisciplinary field of design that primarily emerges from the discipline of graphic design but may also include contributions from other disciplines including art, architecture, landscape, technology, and lighting (Elif 2019). One of the key premises behind EGD is that it can help improve people's experience of place. There are a range of concepts and knowledge sets that underpin this, including some key observations about the role of environments in determining cognitive abilities and sense of place. The field of EGD explains how pictograms, photography, typography, information graphics, and other illustrations

can improve a space's appearance. Generally, there are five types of EGD: branded environment; wayfinding; wall decals and graphics; interactive media, and social media (Calori and Vanden-Eynden 2015).

Wayfinding signs and symbols are probably the most recognised form of EGD, and with the increasing complexity of buildings, cities, and cultures, the design and deployment of widely accessible wayfinding can be very difficult. Applying directional information graphics in urban landscapes and architectures as part of an EGD strategy can help individuals navigate constructed environments more easily by communicating identity and information to create experiences that stimulate place memory. EGD is often used to help establish the architectural style of a building and, in many cases, uses graphics that match an organisation's brand or building design ethos, such as the application of a uniform colour palette, symbolic language, typographical elements, or geometric patterns.

10.2.3 Environmental Graphic Design Healthcare

Environmental Graphic Design is an important aspect of Environmental Enrichment. There are many examples where EGD and other creative forms have been used in hospitals and healthcare environments to improve the patient experience. The Royal Adelaide Hospital in Adelaide, South Australia, included significant EGD in its public space design (corridors, reception and waiting areas, elevator lobbies, etc.), which illustratively draw upon local cultural narratives, and are used to demarcate different areas, creating visually themed areas within this large public hospital (Spence 2017). Similarly, the Chelsea and Westminster Hospital in London, UK, has implemented EGD in the form of strong geometric patterns, playful illustrations, and vibrant colours as part of an art therapy strategy to assist with pain management, anxiety, and depression (Dawood 2019).

The authors have explored how AR might be used as a way for hospital visitors and staff to navigate to and explore sculptural artworks that are located in a number of hospital courtyards at The Royal Adelaide Hospital in partnership with the Centre for Creative Health. The Centre is an interesting example for this discussion because it actively curates the music, art, and other creative initiatives to enrich patients' experiences (The Hospital Research Foundation 2021). The protype mobile application is designed to use graphical symbols placed in the environment to access AR animations, and additional information related to the sculptures including information about the artist and the ideas behind the work (Fig. 10.1). In the developed version, the idea is that it could also present users with an option to access further enrichment activities, including mindfulness content to not only distract, but also to build good mental health (Morichetto and Nilsson 2021).

EGD can help improve both visitor and healthcare employees' experience of their workplace by increasing the legibility of both spaces and processes. For example, the wayfinding approaches applied in Newham University Hospital in the UK help guide patients through accident and emergency check-in and triage processes.

Fig. 10.1 Prototype concept for using AR symbols as in situ visual access point to additional information and interactivity for sculptural works in the hospital environment. Image: Aaron Davis, Harris Murphy, based on the sculptural work of Nicholas Uhlmann—*Tree Flower*, 2016

The development of an easily understood visual information system was shown to help with aggressive behaviours among patients and towards medical staff (Design Council 2011), demonstrating how EGD not only provides visual interest but directly contribute to the welfare of patients and workers in a healthcare setting.

Moreover, when linked with the principles of Environmental Enrichment, EGD can be seen as a way of improving healthcare employees' experience of their workplace, by stimulating creative thinking, cognitive development, and increasing interpersonal interaction (Dzebic 2017). Importantly, these enrichments extend beyond remedial care, and build positive experiences, a principle that is closely linked with the fields of Salutogenic Design and Positive Technology.

10.3 Building Good Health Environments

10.3.1 Salutogenic Design

Salutogenesis describes the process of building good health and is used in opposition to pathogenesis, or the treatment of poor health (Roskams and Haynes 2020). Salutogenic Design principles are often used in healthcare facilities to help create a stimulating and healthy environment for patients. Abdelaal and Soebarto (2019) suggest that Salutogenic Design can be used to create a healthcare environment that triggers the mind to enhance satisfaction, creativity, and enjoyment among patients and medical staff members from a psychosocial perspective. Although this is a complex topic, there are three principles that we will highlight here: manageability, comprehensibility, and meaningfulness.

In the framework of Salutogenic Design, 'manageability' is referred to as the ability to manage day-to-day activities and fulfil personal needs. For example, healthcare providers might employ Salutogenic Design to help educate patients on how to

conduct self-care and manage self-medication even without medical staff. Salutogenic Design can help fulfil the functional needs of end-users (Golembiewski 2017) and can contribute to promoting autonomous motivation (Ng et al. 2012).

'Comprehensibility' in this context refers to the ability of an individual to understand their environment, helping them gain a sense of control and security in their lives (Golembiewski 2017). Comprehensibility enables patients and medical staff to make sense of different aspects of the healthcare surroundings. For example, the Queensland Children's Hospital in Brisbane (like several other paediatric hospitals) incorporates sculptures and bright colours into the environment to enhance the sense of comprehensibility. This approach can be used to create inviting, dynamic, playful and stimulating interior spaces that also provide a sense of orientation and navigation and reduce anxiety (Abdelaal and Soebarto 2019).

The third principle 'meaningfulness' refers to the ability to support the desire to live (Ruohomäki et al. 2015). Ruohomäki et al (2015) suggest that patients may develop a stronger desire to live after learning how to manage themselves in a well-organised healthcare environment. In addition, the introduction of biophilic environments can further add to the sense of meaningfulness for building occupants (Abdelaal and Soebarto 2019). The Khoo Teck Puat Hospital in Singapore brings these principles together through the use of integrated planting and green spaces, colour-coded stairways, and intention design to enhance patients' healing process, transforming the workplace into a more conducive environment for staff (Mittelmark et al. 2017; Messeidy 2019).

Salutogenic Design is technology agnostic and can be applied to both analogue and digital modes of design. However, as we are interested specifically in the role of augmented reality technologies and EGD approaches here, there is one final field to introduce that sits largely in parallel with Salutogenic Design: Positive Technology.

10.3.2 Positive Technology

In healthcare, Positive Technology refers to interventions in the human–computer interaction context that are designed to promote self-growth and positive emotions (Gaggioli et al. 2017). Three important concepts emerge in Positive Technology that can add to our understanding of how spatially situated technologies can improve wellbeing: hedonic devices, social technologies, and eudaimonic happiness.

Hedonic devices create experiences that boost personal mood and improve self-awareness through interaction with technology. An example of this is using smartphone applications to track an individual's mood or performance. Positive Technology encourages an individual's awareness of their inner thoughts and feelings and may involve a form of self-taught basic mediation to keep track of variations in mood (Caldeira et al. 2018). Positive Technology can also be used in social contexts and can enhance psychological wellbeing through increased (digital) connectivity to others (Peters et al. 2018).

Social and interpersonal connection in Positive Technology terms relates to the ability of technologies to maintain or improve social connectedness (Gaggioli et al. 2017). For example, the Octi social media platform uses AR technology to connect people with their friends or families in digital space, with different real-time augmented reality effects adding a dimension of fun that improves the user's experience (Octi 2021).

One of the key challenges identified in the use of these wellbeing mobile applications to promote Salutogenic health is user retention (Baumel et al. 2019; Bauer et al. 2020), making the triggers for interaction with Positive Technology important. Positive Technology can include AR design in addition to various forms of interactive media including mobile applications, interactive games and videos, websites, social media platforms, and digital advertisements (Dhir 2021). In the case study presented later in this chapter, we explore how EGD and encounters in physical environments can be used to prompt interaction with wellbeing-boosting AR content.

A critical distinction between Positive Technology approaches and Salutogenic Design approaches is that because of their digital nature, Positive Technology approaches can be specifically customised for individual users. This allows eudaimonic happiness, or the satisfaction derived from tasks that match one's competencies and abilities, to be triggered. The ability of digital technologies to respond to inputs in real time allows for the level of challenge or complexity to be adjusted in response to an individual's use. In a similar way to the Environmental Enrichment approaches described earlier, these approaches have been successfully deployed in rehabilitation settings, creating games that adjust the degree of challenge to match patients' abilities (Sullivan 2019).

10.3.3 AR in Health

AR has already begun to be integrated into a number of health-related contexts. For example, in medical education and training, the overlaying of digital information onto a 3D skeleton model has been shown to help students build their understanding through fun and interactive learning experiences (Güler and Yucedag 2019). AR applications have also been used to add interactive 3D elements to medical textbooks to improve comprehension of complex content for medical students (Güler and Yucedag 2019). Healthcare professionals can gain insight into medical procedures by using AR technologies (Vávra et al. 2017). The Southgate Medical Centre, Melbourne, Australia, has tested a less painful and stressful injection process for patients that utilises AR to help identify veins on a patient's skin through illumination and image processing technologies (Southgate Medical Centre 2021). In another of the authors' current projects, we are exploring whether AR-based interventions can be used to help reduce patients' experience of perioperative anxiety.

In workplace environments, augmented reality has been shown to help employees comprehend work-related information and improve their overall work experience (Thomas et al. 2014). The flexibility to control how data is presented has been shown

to increase an employee's sense of autonomy and digital competency, while also facilitating collaboration between co-workers (Khan et al. 2020). In response to this, a number of immersive visualisation tools have been developed that allow employees to view and explore complex and content-rich data in different dimensions (Khan et al. 2020). In another approach, Zappar, an AR content creation studio, use an AR application to help their employees better understand the company's values by launching an interactive experience that is accessed by scanning a series of posters in their workplace (Zappar 2020).

The series of concepts discussed here provide a framework for thinking about how AR technologies might be applied to drive improvements in wellbeing that go beyond a satisfactory baseline rather than focusing on remedial supports.

The combination of Salutogenic Design principles and Positive Technology approaches provides an opportunity for content and approaches that might traditionally have been approached in static ways to become dynamic, responsive, and personalised. Inserting AR content alongside EGD provides unique opportunities for rapid prototyping and iteration that can be more responsive and agile than making changes in the built fabric of healthcare environments. This provides the approach with a wide and dynamic range of potential contexts for exploration. In the next part of the chapter, we explore research that is focused specifically on designing an intervention to improve the wellbeing of healthcare staff.

10.4 A Case Study: The Use of EGD and AR in a Healthcare Environment

In this section, we present reflections on an experimental case study that uses design practice and co-design as a framework to explore how Environmental Graphic Design combined with AR content might be deployed into staff environments in healthcare settings. The overarching aim of the study is to improve the work experience and emotional wellbeing of healthcare employees. Of particular interest here, however, is the exploration of the role that designers and design choices can take in the development and testing of different forms of augmented reality content.

10.4.1 Research Design

To investigate the potential of augmenting EGD with AR technologies, three research activities were undertaken: (1) a discovery stage with focus groups and one-to-one discussions, (2) a prototype development stage, and (3) a prototype design testing stage. This discussion focuses on the first two stages of the research, where the researchers worked with end user stakeholder representatives to explore the premise of combining AR with EGD, what this hybrid form might look like, and what content

might be communicated through it. The findings from these conversations alongside an analysis of existing research in the area were then used to develop a testable design prototype.

The experimental case study methodology allowed the designer researchers to reflect on their own experiences while also discussing the perspectives and influences of stakeholder feedback during the design process (Yin 2009). Rather than treating participants as passive subjects, the researchers worked to involve participants in a co-design process, actively seeking their feedback and advice while framing and exploring specific design challenges.

10.4.2 Stage 1: Discovery

The aims of the first stage of the research were to: (1) understand participants' historic and current work experience and work routines; (2) identify preferences for EGD and AR content; and (3) gather ideas for how EGD and AR could help improve participants' workplace experiences. All participants worked in healthcare administration, and a range of levels of seniority were represented, ranging from entry-level administrative assistants to executive directors.

The researchers developed a series of eight graphic representations to stimulate discussion about graphic styles in EGD (Table 10.1). The categorisation of styles was developed from the work of Stefanija Tenekedjieva (2020), from Singapore-based communication design firm ManyPixels. Prompt cards featuring these styles were used to challenge participants to consider the impact of different graphic styles on their overall workplace experience, rather than to simply express a personal aesthetic preference. A tree was chosen as the basic visual form that could be represented in different visual ways. The prompt cards were successful in overcoming the challenge of participants defaulting to what they knew rather than what they might be able to imagine (Perez et al. 2019) and helped to stimulate discussions that went beyond 'I like this one' to critically engage with what each style conveyed as well as the affect it may have on workplace wellbeing.

The data gathered from these discussions was analysed using inductive thematic analysis process, following the Gioia methodology (Gioia et al. 2013). The inductive thematic analysis process is informative in design-based explorations because it allows themes and ideas to be emergent from the data rather than relying on a pre-determined classification system to identify areas of focus. In general, participants highlighted the importance of the visual environment in workplaces, echoing the significance of Environmental Enrichment, which links environmental quality with physiological changes that can affect our wellbeing. A summary of the thematic coding is included as Table 10.2.

The study participants did not have extensive experience with AR content, and although they agreed it sounded a promising idea, none had experience with AR content interfacing with EGD. When prompted, participants were able to recall television displays being used to passively communicate information to employees,

Table 10.1 Graphic styles implemented in prompt cards

Graphic style types: focus group discussion			
Graphic style	Description	Application example	Visual example
Photography	Digital photograph, may employ digital manipulation including filters, often retaining sense of realism	Contemporary visual art architectural renders, CGI in motion graphics	
3-Dimensional	Employing recognisable forms, may incorporate similar level of realistic representation to photorealism or a level of simplification, created with digital 3D software	Animation, motion graphics, architectural visualisation, virtual and augmented reality graphics	
Geometric	Characterised by use of two-dimensional geometric shapes to create simplified yet recognisable forms	Corporate illustration and logo design, large-scale murals	
Flat Design	Two-dimensional, simplified, recognisable forms, utilising areas of 'flat' colour to create form, usually with a range of tonal values. May employ organic lines and shapes, differing from geometric style in this respect	Applications that require simplified images including corporate or promotional graphics, web design and advertising	
Abstract	Utilises line, shape, colour, mark making to create a pleasing visual aesthetic independent of realistic representation	Visual art, corporate communication design	
Minimalism	Forms simplified to their most essential structures using minimal visual elements	Visual art, communication design for corporations, wayfinding graphics	
Grunge	Characterised by gritty, often dark visual textures and experimental visual mark making	Music album artwork, poster design, expressive visual art	

(continued)

Table 10.1 (continued)

Graphic style types: focus group discussion			
Graphic style	Description	Application example	Visual example
Typography	May be illustrated letterforms, handscript or regular typefaces. The visual characteristics of the line stroke, colour and weight form visual communication independent of the reading of the word(s)	Ubiquitous usage for a range of applications; featuring prominently in poster design, wayfinding graphics, book design	

Table 10.2 Summary of thematic coding of data generated from discussions

Preferred type of EGD at the workplace			
Graphic styles			Subject matters
Least preferred	Ideal	Most preferred	Illustrations that resonate with personal experience
Geometric	3-Dimensional	Abstract – Can portray tranquil work environment	Positive experience – Festive seasons/celebrations – Countryside scenery – Adorable pets – Wedding in a forest
Grunge	Flat icons – For data presentations		
Typography – Can be a form of noise – Can be unreal; bash	Photography – More realistic and pleasant looking	Minimalism – Promotes imagination – White space approach	

and to share achievements through elementary dashboard setups. While these were generally viewed positively, participants did not connect these with either wellbeing or productivity. Participants responded very positively to the idea of shifting away from a television screen and into a more immersive environment, however, there was a strong preference for this to take place in a mixed mode where both digital and physical elements worked together rather than a completely digital space.

Unsurprisingly, in the more general discussions about workplace wellbeing, participants focused on the creation of a visually pleasant work environment and linked this with their levels of personal motivation at work. When presented with the examples of different graphic styles (Table 10.2), the minimalist graphic illustration style was consistently identified as the most preferred, with photography a second preference. The least preferred graphic style was geometric with participants describing this as ‘congested, blocky, and outdated’. Similarly, both the grunge style and the typography style were considered ‘confusing’. These comments are interesting in the context of EGD and augmented reality because the digital nature of content may allow the layering of multiple approaches into a single space or

image—something that was not initially considered for the prototypes. In stating their preference for the minimalist style, participants described the uncomplicated design style as being 'restful for their eyes' and generally expressed a preference for uncluttered information with a thematic use of colour. The minimalist example was also considered to promote creativity and imagination and encourage their minds to complete images.

Participants expressed a desire to engage with EGD and augmented reality in their shared workspaces spaces. In particular, they highlighted break spaces and entry-spaces as key areas that might be utilised. Participants discussed a range of content and information forms of interest. There were several different suggestions ranging from the use of inspirational quotes to purely image-based content. These insights and stimuli were reflected upon by the researcher designers in the development of a series of design prototypes in the second stage of the study.

10.4.3 Stage 2: Concept Development

The development of design concepts focused on how the information gathered in the first stage of the project might be interpreted and then represented back to participants through an EGD and AR prototype installation in their workplace. This stage also allowed for the exploration of the interface between the EGD and the augmented reality content and used a number of the inputs from participants in the first stage as provocations to guide the explorations.

Three technology approaches were considered in this stage of the project: (1) adding AR content to the EGD through head-worn AR displays, (2) adding AR content via a mobile device screen, and (3) using projector-based situated AR technologies to add AR content into spaces without the need for a weareable or handheld intermediary device. For the first approach, head-worn displays, including optical devices such as a Microsoft Hololens or Magic Leap, and video see-through approaches such as a live-video enabled Occulus virtual reality headsets, overlaying AR content into the viewer's entire field of vision were considered. These are often the most immersive approaches and have the advantage of capturing the entire field of vision and allowing for the mapping of three-dimensional content into spaces. By contrast, AR based on mobile device screens (approach 2) creates a less immersive effect by adding virtual reality content through the frame of the device's screen. Approach 3, Spatial Augmented Reality (SAR), which is typically projector-based, enhances the appearance of objects and surfaces in the physical world. Rather than being viewed through a personal headset or personal device, SAR facilitates a public experience of the augmented content (Marner et al. 2011). In Table 10.3, we begin to explore the relationship between these three approaches and the environmental graphics.

The insights gained from participants in the first stage of the case study indicated that people were keen to have a seamless engagement with the digital media and that different people would benefit from distinct types of content being embedded

Table 10.3 Exploring the relationship between technological approaches to augmented reality and EGD

Approach	Location of augmented reality content	Presence of augmented reality content	Privacy of experience of augmented reality content	Customisation of augmented reality content	Role of the environmental graphic	Dimensions in augmented reality content
(1)	Head-worn display	Mediated/choice (unless wearing display in advance)	Individual	Simultaneous	Merging of digital information with physical environment	3D or 2D mapped into 3D/4D space
(2)	Mobile device screen	Mediated/choice	Individual or shared	Simultaneous	Merging of digital information with physical environment	3D or 2D mapped into 3D/4D space
(3)	Projected into space	Immediate/default	Shared	Time-separated	Merging of digital information with physical environment -Base layer to build upon	2D projected into 3D/4D environment

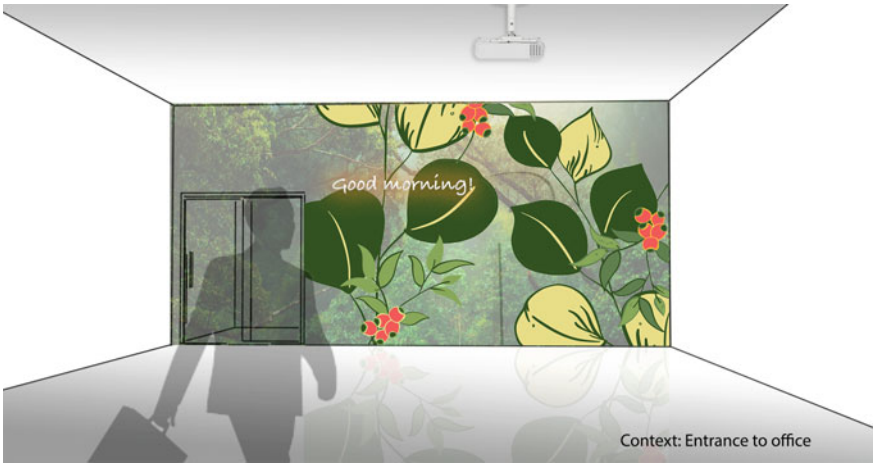

Fig. 10.2 Prototype design of the 'engage' concept with office entrance space. Image: Aprille Chua

into the AR experience. This informed three approaches were taken forward into the design prototyping process based on the concepts of engage, relax, and inform.

The first concept prototype, 'engage', focused on the provision of greetings when entering the workplace environment. AR was seen as providing an opportunity to incorporate a variety of languages and to bring forward a series of culturally appropriate metaphors. In the prototype for this concept, SAR is used to augment a landscape-based environmental graphic proposal for a workplace entry (Fig. 10.2). The prototype proposal includes motion sensors to enhance user interaction as they enter the office space.

The second concept prototype, 'relax', is designed to be deployed in a staff break space and uses the mobile device-based approach (approach 2) in combination with a SAR approach (approach 3) described in Table 10.3. This idea uses a minimalist/simplified forest illustration as a base image that has been designed in response to feedback from the first stage of research. In this instance, visual effects that are focused on building Salutogenic and biophilic health and wellbeing are added through the AR to target an uplift in participants' mood and create a relaxing atmosphere (Fig. 10.3). The combination of both passive observation of the AR content (through approach 3) and active engagement (through approach 2) provides a variety of options for engagement.

The third concept prototype, 'inform', is focused on adding a layer of work-related information to workspaces through AR. Unlike the first two prototypes which engaged all occupants of the spaces through both mobile devices and SAR, this prototype utilises the individually controlled AR capabilities of the handheld devices staff use in their day-to-day work to overlay work-related information into their workplace environment (Fig. 10.4). This prototype investigates how the placement of small EGD icons in a shared office environment can link to a range of data sources. This was developed in response to the participant contributions in the first stage of

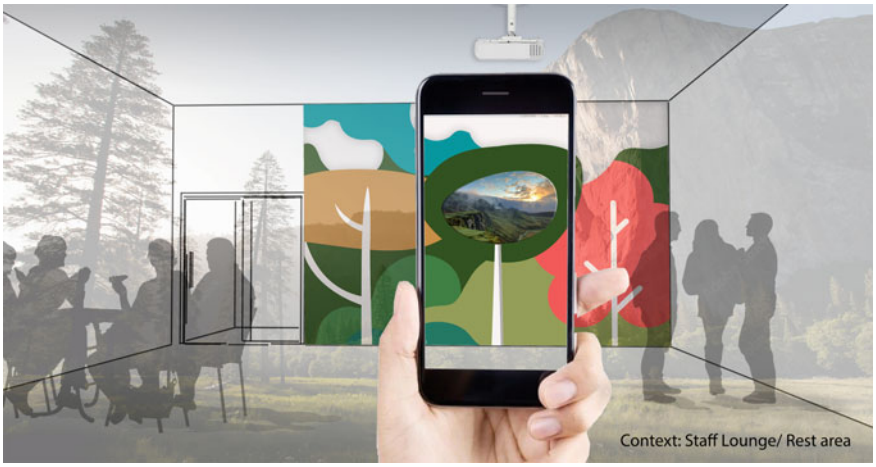

Fig. 10.3 Prototype design of the 'relax' concept within a staff break space. Image: Aprille Chua

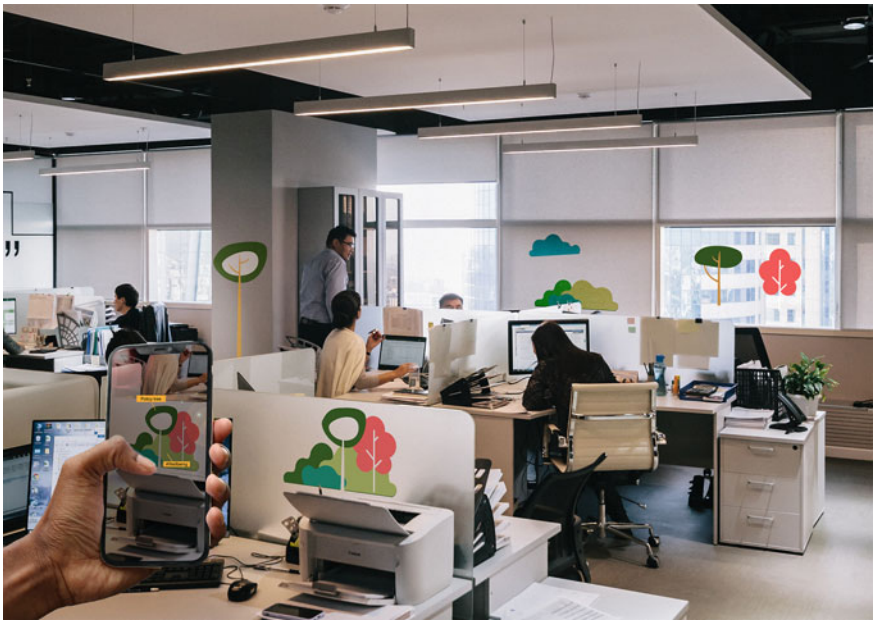

Fig. 10.4 Distributed AR/EGD interaction, 'inform' concept in an office space. Image: Aaron Davis, Aprille Chua

the project that focused on the potential of building a sense of empowerment for employees. The initial concept prototype explored the provision of information about office events, local environmental data, and staff achievements. Further development is investigating how these EGD and AR interventions can help to reduce the stress of complex job tasks, including accessing and filtering complex reports and policies.

10.5 Conclusion

Although AR technologies have been around for many years, it is only recently that the general public has become accustomed to the idea that everyday signs, symbols and objects might be a doorway to layers of digital content. Games such a Pokémon Go and interactive AR experiences in museums and other cultural locations have helped to spread the potential of AR and familiarise people with the forms and devices through which AR can be experienced.

Interventions in healthcare environments have typically focused on restoring the health of patients, rather than the wellbeing of healthcare employees. The initial explorations described here suggest that there is great potential for applying AR in healthcare staff environments, but the concepts discussed in this chapter are also applicable beyond the healthcare context because all built environments have a significant impact on our overall health and wellbeing.

The opportunities for building Salutogenic wellbeing through Positive Technology approaches by bringing together EGD and AR appear to be significant, and our initial explorations appear to hint at a future where AR may literally enliven the visual fabric of our shared workplace environments.

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Chapter 11
Augmented Reality Interventions in Shared Space: Subversion and Social Impact

Nancy Baker Cahill and Jesse Damiani

11.1 Introduction

Artist Nancy Baker Cahill and writer/curator Jesse Damiani first began working on augmented reality interventions together in 2018, and since that time have maintained an ongoing critical dialogue about the potential of augmented reality art as a means of driving social change. Through 4th Wall App, Baker Cahill has delivered or hosted projects including *Defining Line*, *Battlegrounds*, *Margin of Error, Only Revolutions*, *Liberty Bell*, *In Plain Sight*, *Contract Killers*, and *Mushroom Cloud*, emerging as a leading artist and thinker at the intersection of augmented reality and public art. In the course of this work, Baker Cahill developed an intimate understanding of the conceptual possibilities of AR as a tool for social change, as well as the practical realities of developing and deploying site-specific AR interventions. She has also built a new rigorous and aesthetic practice of monumental AR drawings/sculptures as a new form of "land art" all over the globe. In Damiani's work as a curator and writer, he found that most people in the general public have thus far approached AR as a gimmick or technological novelty. This interview was an opportunity to engage Baker Cahill's deep understanding of the medium and its potential for lasting impact.

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11.2 The Interview

Jesse Damiani (JD): Let's start with your augmented reality (AR) origin story: how did you make your way to AR?

Nancy Baker Cahill (NBC): Back in 2017, I was making bespoke drawings in virtual reality (VR) and was frustrated with my inability to share them more widely because of accessibility issues related to hardware and exhibition opportunities (or lack thereof). When I expressed this frustration to my development team at Drive Studios, they suggested creating an AR app, which would allow me to translate my VR drawings into AR. This immediately cracked open all kinds of possibilities for public engagement. Using the app, I could invite an unknown and unseen audience to experience my work on their terms, in the contexts of their choosing. I also wanted to challenge what "public art" might mean in the hands of individuals versus institutions. The app became an invitation to play and collaborate creatively. I called it "4th Wall," which is a theatrical term for the invisible "wall" that separates actors from their audience and to reference layered realities of all kinds.

JD: And the first rollout of the 4th Wall AR app was a bit different from how it exists today.

NBC: Yeah, the first rollout was in February of 2018. I wanted the app to reflect the analog part of my drawing practice, so the UI was, and still is, hand-drawn with graphite pencils. The very first iteration had four of my VR drawings translated into AR, featured a portal that viewers could pass through into my studio (which we had 3D-captured using photogrammetry), and offered a volumetric capture of me talking about the conceptual underpinnings of the work. That part was unintentionally deadly earnest, so it didn't make the cut for the next version. It was critically important to me that the app be accessible in as many ways possible so we included a teleport function inside the studio experience so that if the viewer were mobility-constrained they could still navigate the space and spend time with my graphite drawings on the walls.

JD: So, you build this first version of the app, and people start playing with it. They start putting your AR art in places like on the conveyor belt in the baggage claim of LAX (Fig. 11.1).

NBC: They put the drawings in wildly imaginative contexts all over the world, and fortunately for me, shared many of them on social media.

JD: What did that do to your thinking about AR?

NBC: A pivotal point for me came when my dear friend Tanya Aguiñiga, an artist and activist, put one of my AR drawings in the USA and slowly pulled it through the border wall into Mexico, underscoring that art is and should remain borderless (and even more importantly, challenging border walls in general). The video she recorded remains one of my most treasured captures. It was a complete lightbulb moment for me; I had hoped that people would really push what was possible and she took it to the next level (of course it was an artist!). In that one poetic gesture, she opened up an entirely new conversation around site-activated content creation. I went back to my team and asked how we could expand upon this idea, and they suggested integrating

Fig. 11.1 Nancy Baker Cahill, *Hollow Point 101*, LAX Baggage claim, capture by Rich Lee via 4th Wall app

geolocation into the app backend. This was the inception of the Coordinates feature in 4th Wall. I knew I wanted to share it with artists I respected who made rigorous, socially engaged work. This feature on the app has since hosted multiple exhibitions and dozens, if not hundreds of collaborations with individual artists. In all cases, the curatorial invitation—regardless of theme—has been to pair an artwork with a location which, in the pairing, might have added resonance or value, or discursive potential outside of any traditional institutions or frameworks.

JD: I want to dial back to the moment at the border with Tanya, because there's something fascinating about this moment where the limitations of the technology precipitate a line of inquiry that in many ways is at the core of 4th Wall now.

NBC: It was a genesis moment, one that was both symbolic, conceptual, and extraordinarily generative, because I thought, "Wow, if you can do that with one of *my* artworks, what could you do with one of *yours*?" She was the first artist I invited to participate in Coordinates. Per her instructions, we geolocated her piece "Impotence Incarnate" directly over the border wall in Playas de Tijuana, where it remains today (see Fig. 11.2). The work comments on the powerlessness one experiences at the border and the traumatic despair caused by the border wall itself. Every other artist I invited after that subsequently created equally thought-provoking, meaningful work in interventions all over the globe.

JD: A lot of early AR platforms either tried to rush 3D or they focused on image-recognition on 2D surfaces, which essentially involved animating still imagery. But what 4th Wall did in its early days was different. 4th Wall let artists bring their existing analog artworks into AR as digital files and situate them in specific locations. It allowed work that couldn't otherwise have been public art to become public art—and it was this conceptual angle that the app asked people to grapple with. How were you thinking about that first wave of the app where you had your own 3D, VR drawings that you've brought in as well as these curated, geolocated works as 2D representations?

NBC: Well, first of all, it allowed me to collaborate with an incredibly broad range of artists. None of the artists had to be digitally fluent in any way. But most importantly, and more to your point, I privileged ideas first and foremost. It wasn't about impressing audiences with technologically flawless spectacle, but was intended to wow people in terms of the potency of the artists' ideas. When you put a piece of art over a toppled Confederate statue, over a prison, on the riverbank in Nuevo Laredo, Mexico, where a young Guatemalan immigrant was murdered by US Border Patrol—just to name a few examples—the work has a different resonance and gravity. I felt it was important to use AR to provoke conversation, tell untold stories, and shine a spotlight on injustice. We all wanted these AR interventions to provoke thoughtful conversation. Because AR is invisible to the naked eye and requires a visual prosthesis, these conversations could be unveiled and remain invisible (and yet very much present) until the viewer activated them. It was clear that the sensory immersion of standing in a specific place and time, with its weather, scents, textures, and sounds added so much to the experience as well. Crazy that our little pocket computers we call phones made this possible.

JD: One thing that you've expressed in the past is the way that knowing where an AR piece is changes your relationship to that place—as if it's a place in which you have an embedded personal memory or connection. Can you talk about that kind of ghost resonance that exists in sites that have been intervened with AR?

NBC: I think once you've experienced a powerful AR artwork in shared immersive space with all senses engaged, it's hard to forget. It lingers in your consciousness, like memory. There is a beautiful piece by Andrea Chung over the LA River in the *Defining Line* exhibition (Fig. 11.3), which I co-curated with Debra Scacco. The piece is about colonization and invasive species. This artwork was geolocated on the way to my studio. Every time I drove past it, even though I couldn't whip out my phone and look at it (I would have crashed), I was awash in the powerful feelings it

Fig. 11.2 Tanya Aguinga, *Impotence Incarnate*, 2018, Playa de Tijuana, Mexico, via 4th Wall app

Fig. 11.3 Andrea Chung, *Filthy Water Can Not Be Washed*, 2017, Los Angeles River, via 4th Wall app

provoked the first time I experienced it. So, her work created a kind of index in my brain, such that I could never drive past that site without thinking about her work and what it elicited in conversation about the LA River, and more broadly about America itself.

JD: And that also gets back to this notion of the artwork becoming a part of you and your spatial experience in a way that it doesn't necessarily when it's mounted on a white wall.

NBC: Because it's a deeply embodied experience. I think back to that moment, where we were geolocating a couple of artworks over the Bonnet Carre Spillway in Louisiana, an extremely fraught location built over a known cemetery for enslaved people. The visceral impact of the texture of the air, the heat, ambient sound, all of that sensory input in combination with the artist's unsettling images overlaid against the landscape…it had a much more profound and lasting impact than any possible experience of the work in a sterile, traditional exhibition environment. This is instead a direct conversation with landscape, with history, with erasure.

JD: Speaking of the Bonnet Carre Spillway and untold stories, this brings us to *Battlegrounds*, which was our first co-curated project together, after I'd been fortunate to show your VR and AR drawings in the *Spatial Reality* exhibition.

NBC: I remember when we hatched the idea. You asked, "What if we could just light up a city with AR?" After we got over the excitement of doing such an ambitious thing, both of us took a step back and realized that this had to be done thoughtfully, intentionally, and respectfully. There needed to be a lot of groundwork in advance so that community engagement was impactful and relevant. After a lot of discussion, soul-searching, and research into our shared obsession with impending civic strife, we decided to go on a research trip in the Deep South, because it was a part of the

world that was underrepresented in art discourse, and also historically fraught. If we were going to engage the topic of contested spaces, there might be a rich and generative conversation around these literal and figurative battlegrounds—which is ultimately what we called the exhibition.

JD: Neither of us has deep New Orleanian heritage, which I think actually ended up being a crucial aspect to *Battlegrounds.* The way I often think about our curation with *Battlegrounds* is as a synapse network, with our initial conversations leading us to more people, and more people, and so on. What was so exciting about that exhibition was that it wasn't so much that we came in with an argument or a stringent idea, but rather a prompt. We brought a general intention and an understanding of the technology, and then the community in New Orleans rose to the occasion to connect all the different nodes. The only way it was able to become the largest AR public art exhibition in history is precisely because of this collective effort.

NBC: It, too, was an invitation to conversation. We had no desire to impose any rubric, strictures, limits—we just wanted to know what these extraordinary artists felt were contested spaces and how their artworks might illuminate and complicate them. The range in locations and contexts was dizzyingly profound—24 artists and 30 artworks—and thus it was super gratifying when the *LA Times* covered it with such detail. *Battlegrounds* moved me to tears because of the content of the works. Again, artists were addressing issues of erasure, but also systemic injustice, gentrification, climate crisis, and every other challenge that we're continuing to grapple with in America and around the world, so it felt like a kind of a microcosm of and a mirror for what's happening acutely and broadly in this moment (Fig. 11.4).

JD: There's a way in which art discourse is often defined by the ecosystems of the megalopolises, of which LA is one. What ends up happening is that entire bodies of work and lines of interrogation are—if they don't have a direct connection to the current interests of these major hubs—implicitly erased, forgotten, or left behind. *Battlegrounds* was almost like a proving ground or a blueprint for how the thematic interests of a specific place could manifest itself *in that place* by artists who live and work there in a way that is also harder to ignore on the national or international scale.

NBC: Totally. That's the beauty and privilege of having a platform that answers to no one. You can host exhibitions in places that might not have as prominent a voice in traditional forums, and yet are every bit as rich and impactful.

JD: Shifting from your AR curating and producing to your own artworks: what has been the progression from those initial *Hollow Point* pieces on 4th Wall to your current work on the app today?

NBC: I'm so fortunate to work with talented collaborators, first Drive Studios and now Shaking Earth Digital. I really wanted to continue making drawings in VR, because that's part of my practice, and translate them into animated AR artworks with sound. With help, I've been able to produce a series of large-scale artworks, each of which is pointed in its conceptual intentions, all over the globe. Many target ideas that found discursive popularity in the quote-unquote culture wars from 2016-on. One of these artworks in particular asked tough questions about the founding ideals of this country, none of which are simple or inviolate. It grappled with contested

Fig. 11.4 Ana Hernandez, *Slavery Time*, 2016, New Orleans, LA, via 4th Wall app

ideas that in my opinion warrant additional scrutiny and unpacking in the context of what we are currently living through.

JD: You're talking about (among other things) a project called *Liberty Bell*, could you share a bit more about that project and its goals?

NBC: The project started as an invitation from Art Production Fund to create a bespoke piece for an event in Philadelphia. When I started thinking about Philadelphia—this was in early 2019—I tried to recall memories from my childhood about Philadelphia. The thing I remembered most vividly was the Liberty Bell itself. As a child, I remarked to my aunt that I didn't understand why this famous bell was cracked and yet still intact. That specific memory struck me as relevant to this. I felt that the idea of liberty in a moment of incredible misinformation, mass incarceration,

Fig. 11.5 Nancy Baker Cahill, *Liberty Bell*, 2019, Lincoln Memorial Reflecting Pool, via 4th Wall app

systemic racism, vast economic inequity, religious fundamentalism, unchecked white nationalism, climate crisis, the list goes on—that the idea of liberty was a broken one. In the abstract, liberty was a beautiful concept, but what did it mean applied philosophically versus our reality rendered legally, culturally, politically? Who actually experiences liberty? And what does liberty mean, in any number of contexts? This was the impetus for the original artwork in Philadelphia. Art Production Fund subsequently asked if I could expand the scope of work to include other sites as well. My answer was yes, because you could truly put it anywhere in the USA, and it would have resonance. We ended up choosing sites along the Eastern Seaboard of historical and cultural resonance, from the early genocidal and colonizing origins of the US through the Voting Rights Act of 1965 in Selma, Alabama. So the artwork appeared in nine different locations (six cities) along the East Coast (Fig. 11.5).

JD: Another one of your pieces, *Legacy*, has now lived in Austin, Los Angeles, Berlin, and Seoul. It's a piece that invokes topics like the climate crisis and gentrification. How do you think about the pieces that have the "right" or capability to be situated globally, versus pieces like *Liberty Bell* that would not make sense anywhere else but these specific locations within the USA?

NBC: I think the beauty of being able to geolocate work means that you can have incredibly local conversations, and you can extrapolate beyond that to larger global conversations. Particularly with the work that you just mentioned, *Legacy*, climate crisis is an existential global threat. There is value to examining these issues outside of formal contexts. I feel like a lot of the local conversations have national and sometimes international resonance, as in the case of climate change. There are huge geopolitical challenges that we're facing that warrant additional engagement, and AR obviously allows for that.

JD: A big interest for both of us is how AR can be used to stage interventions. There's obviously a long history of physical art intervening public space—what makes AR interventions unique in the landscape of public art?

NBC: Well, part of their power, I think, is both their abstraction and their engagement with consciousness in a deeply embodied experience. These experiences are temporal and (for now) ephemeral. This relies upon different types of perception that a traditional art experience really doesn't. What I mean by that is that you need this visual prosthesis to view an added layer while you're simultaneously taking in your entire environment through your senses. It reminds me of the time I gave a lecture about AR and somebody in the audience took me to task for the term "augmented" reality. I defended myself by adding that I hadn't named it augmented reality (talk about killing the messenger), but I do think that it is an augmentation of reality. I think it's apt because it's an amplification—an opportunity to augment ideas. One of the most resonant things ever shared with me on the topic originated with a lawyer at Stanford named Ticien Sassoubre. We had been discussing the ways in which AR will be policed and monetized, and that these unapologetically political DIY interventions that I was a part of—where we hadn't asked for permission—might one day be imperiled. She advised me to tread carefully around the semantics of site intervention, site activation, and site specificity. Her idea was that we should be using the language of *idea* activation, because that's what's actually being activated. So when I say that it's abstract, or related to consciousness, I mean that what is being activated isn't necessarily material. It's a dematerialized idea that exists in a shared cultural thought space. We can't own or sell it, hold in our hands, or engage with it outside of this very deeply conceptual, experiential series of considerations.

JD: You're invoking some really complex ideas about space, and more specifically about public space. When we think about the "end product" of AR art—at least as it has existed in the 2010s and early 2020s—often it's as videos or photos on social media. Theoretically, somebody could just intervene those sites asynchronously with visual effects and video editing techniques, and post those to social media. The end user would likely be none the wiser. So, the differentiating factor of AR is the experience of actually being there, having a real-time experience with the work and capturing your own specific recording, just as you might with a piece of physical public art.

NBC: I think even the term "public" is a contested idea. Social media is a perfect example of public space. For that reason, I like to call what we've traditionally termed "public space" as "shared immersive space." Public space feels really complicated to me. I had an incredible conversation in 2019 with Los Angeles County Museum of Art (LACMA) curator Britt Selveson about this, and her observation was that AR contains infinite performative potential, and that when people record themselves interacting with a work, they write themselves into the experience, into that textual record, through video. They were activating and recording that moment that located their bodies and individualized experience in timespace. She noted that there has been an almost imperceptible ontological shift in the viewer to claim agency, active participation—just *being* there, as if to say, "I experienced this, this is me recording my experience, my experience mattered." The sharing and public archiving of those experiences through social media was an almost defiant reclamation of self and selfhood in the context of an AR experience.

JD: You've also spoken about your experience as an artist witnessing viewers gathering around one person's phone—essentially like gathering around the campfire to have this art experience. Your pieces "Margin of Error" and "Revolutions" were part of the 2019 *Desert X* biennial, in areas where there was limited cell service. It was a context in which you ran into a lot of the material constraints of AR at the time. Only a small number of people came prepared by downloading the app in advance, or were among the lucky few who had enough service to be able to download the app in time. All the rest of the *Desert X* artworks were physical pieces where you could take it in completely according to your own movement and interests. You could wander off and have your own experience. But what ended up happening with your AR pieces is that there was this need to gather around whatever phone could activate the experiences, this very small window to the work, applying a rectangular frame that in many ways now defines our experience of reality.

NBC: Oh my god, I really like that angle. So that is part of the cyborg experience. These artworks, and the considerations of all the questions that they raise, are entirely dependent on a technologically mediated experience. The deep and beautiful irony of that particular biennial is that what we generally assume about technology is that it keeps people isolated, with the illusion of connectivity, the illusion of connection. By contrast, the biennial invited viewers into the shared immersive space of the exhibition (take the Salton Sea, for example, where I had geolocated "Margin of Error") and even if someone was less technically fluent, or they didn't have access to Wi-Fi, they forgot to download the app, or whatever, they were included in these impromptu conversations and small communities which sprung up around the experience. You'd find people clustered together (pre-pandemic, of course), huddled around a phone, recording and sharing the experience, and sending the files to each other. Most importantly, to me, complete strangers were talking about the content and grappling with what it meant (Fig. 11.6). I was interested in learning what it elicited in the viewers viscerally, intellectually, experientially. How did it affect them? That is part of the great joy and potential of AR, that it can do all of those things all at once. But yes, it does rely on this vector, this prosthesis, this "phone." I remember I was being interviewed for a podcast by a journalist, and she said she'd much prefer to see the artwork in the sky without a phone. And I remember thinking, like, "Wouldn't that be amazing? That would also be a *hallucination.*" It's not tenable (yet) without mediation. I'm okay with that, as long as we're critically engaged at all times, with what that mediating tool allows and disallows (itself a whole other conversation for another chapter!). It's where we are right now, we don't have the contact lenses yet—we don't even have broadly available AR glasses that allow us to have this hyperreal experience.

JD: It makes me think about the early days of other popular art, communication, and media formats: the novel, the telegraph, film, the radio, TV. There's this period of time when the affordances of a medium are not fully understood, the conventions are still gummy, and the lack of clear-cut lines and standardization makes it difficult for many people to create with these tools. And even though it's frustrating, there's actually something very magical about that period that will never really be possible again once the barriers dissolve. The things that don't work are essentially implicit

Fig. 11.6 Nancy Baker Cahill, *Margin of Error*, 2018, Desert X Biennial, Salton Sea, California, via 4th Wall app

challenges posed to the artists who are trying to creatively problem-solve. In the version of reality, five, 10, 15 years from now, whatever it is, where AR glasses or contact lenses are commonplace, you'll lose that shared group experience that you describe with *Desert X*, and with it the social bonding that occurs precisely *because* there's this clunky constraint during the early days of the medium.

NBC: I actually love that. Legacy Russell's *Glitch Feminism* (Russell 2020) springs to mind immediately. The glitch of it is the slippery part, the inherently subversive part, the uncontainable part. The minute that we have a slick experience or an invisibly mediated experience it loses the required suspension of disbelief. When we go to the theater, we know were there, we know we're sitting with others when someone coughs behind us, somebody's phone goes off, whatever, there are these moments of interruption. But we've bought in, we've decided, okay, we're showing up here because we want to be transported. And that's sort of how I experience AR now. It's like theater—no accident that my app is called 4th Wall. When AR becomes technologically integrated to a point where suspension of disbelief is no longer possible as an action and as a conscious decision, it becomes something potentially nefarious, depending on who or which corporation is doing the mediating.

JD: For posterity, we might want to note at what point in tech history we're having this conversation.

NBC: We should definitely know that. Facebook just rebranded to Meta.

JD: AR facilitates a real, spatial, dematerialized experience, which I think is unique to AR. I don't think it exists with other new media art forms like projection mapping or light art because of the intimacy with which we relate to our individual device. When you're seeing a monumental projection, a monumental piece of

light art, you might record it through your phone and thereby create intimacy in the recording of the work, but it's not generated in real time the way it is in AR.

NBC: Intimacy questions are really interesting, because even if you're sharing your experience, it is generated from your own personal black mirror to which you have a cyborgian attachment. As such, you are, again, getting into something more related to timespace. The moment that you are experiencing the work, it is unique to you, your position on the globe, a moment in time, the weather, the date, whatever, all those sorts of identifying features, if we choose to engage those metrics. This of course gets into more philosophical considerations of time—but we can leave those to Carlo Rovelli who is far more eloquent than I am.

JD: I'm sure he'd be thrilled. Speaking of which, you reference "timespace"—is that your intentional inversion of spacetime? Are you making an argument about spacetime by using timespace instead? It does seem to relate to AR.

NBC: I think that might be my own conceptual dyslexia. The difference between timespace and spacetime, to me, is that timespace emphasizes the temporal and space time prioritizes the physical experience. Maybe this has to do with geolocation more than anything, but because of geolocation, it has to do very much with time itself. My app tracks the position of the sun based on the viewer's GPS and the time of day and casts shadows accordingly. I think the impermanence of many of these installations also creates provocations around time. One intervention might be a.png of Putin as a puppeteer over a Trump rally, which we did back in 2018. That's a one-and-a-half-hour intervention, tops, whereas *Liberty Bell* was exhibited for 18 months.

JD: Speaking of time, this interview seems to me to have two purposes: one for the near-term knowledge and the other as a reference artifact, a signpost. I think there are people who will read this interview in the next few years and be able to glean knowledge from the way you've approached AR in your practice. I also think there's this inverse function of it being testament to what AR was "back in the day" for somebody in say, 2040, for whom there was never a world without AR. How do you think about this infancy period, particularly as somebody who's really defined the conversation around art expressed in augmented reality? Is there a type of artifact of this time that you think is worthwhile for somebody who never knew anything different than AR to consider?

NBC: That's such a great question. There's so much to say about AR in this moment. I'm sure in 2040 the idea of occlusion will be laughable—the way that the lack of occlusion breaks the spell, the metaphoric fourth wall. We've already covered hardware, but what about when it's embedded under our skin? Perhaps we will long for this period of glitchy intermediation.

JD: What is something in this messy period, when we're figuring out AR, that runs the risk of being washed out or standardized or streamlined? What's a dream of AR that lives now, while very little is locked in? Because so much of AR is still conceptual rather than literal and technical. In the '90s, for instance, you had people writing and talking about VR in highly conceptual and philosophical ways, a lot of which still outpaces the conceptual and philosophical thinking and writing about VR in the 2010s because by then it was becoming literal, and there was an industry with

companies and products and economies. I think there's an equivalent thing happening with AR now versus what AR will be in the coming decades, where there's a lot of conceptual terrain that is worthy of signposting. Nobody can claim to have all the right answers right now. What are the ideas that you think are sacred in AR, or the things that you think are weird and kooky and worth considering far into the future?

NBC: To me the sacred thing is ideas. With all of the AR monument projects so far, I think the most conceptually rigorous have been the most impactful. *In Plain Sight*, a massive project—the AR component of which was hosted on 4th Wall—was conceived of and executed by the artists Cassils and rafa esparza in collaboration with 80 other artists to protest immigrant detention centers and human rights violations. The AR for *IPS* involved individual skywritten messages of solidarity over detention centers and immigrant prisons. This deceptively simple idea was gutting. Few projects have been as exhilarating, and as of this date the messages remain geolocated over those prisons all over the US. To me the ideas are what are inviolate. How they manifest will change with time, but if the emphasis is on impact, we can continue to use AR for social change. My hope is that the primacy of ideas will persist as a metric of excellence versus the supremacy of a given technology. I would never want to censor or police anyone's creative output—of course there is room for the decorative, the shallow, the silly, there always has been and always will be. But I do think that as a tool for engagement and as a tool for provocative, discursive work, AR behaves like no other medium. We might look back at the ways the glitchy parts are charming or hilarious, like when a geolocated piece appears the size of a postage stamp when you're a mile away (imagine the performative things you can do with that!). When it becomes more integrated and more real, it also becomes potentially more manipulative. Right now, to me at least, it exists in a place of poetics.

JD: One thing you brought up that I'm latching onto is this idea of remembering to keep it monumental: remember to let AR continue to be a monument. When so much of your world is manifested in AR, it will probably be much harder than now to thoughtfully engage with a piece of AR art. Because when you're getting alerts, emails, directions—all this functional, pragmatic augmentation—there's an implicit mundanity to AR, which could make it harder to approach art delivered in this form as monumental. The idea of a monument, even traditional physical monuments, is suddenly under threat because we'll be able to interpolate, manipulate, graffiti, and remix space whenever and however we want. It seems like AR is both the "killer app" for monuments and it's also potentially the death of monuments. The friction that exists today has been key to facilitating engagement with your AR art as monumental. The minute that everybody can layer their worlds in AR it will become more like a utility, the way we rarely remember how miraculous electricity or running water are. The more it heads in that direction, the harder it becomes to evoke the monumentality of AR. I may be fixating on a narrow slice of a bigger comment you're making, but that's what's really landing with me: that right now we're in this simultaneously frustrating and beautiful fleeting period where AR can embody its monumental potential in a way that will likely be much more difficult in the future.

NBC: My AR project for Art Basel Miami, *Mushroom Cloud*, amplifies the idea of monumentality by engaging what's colloquially known as the "ergonomics of awe."

Fig. 11.7 Nancy Baker Cahill, *Mushroom Cloud*, 2021, Miami, FL, via 4th Wall app

I created a massive mushroom cloud drawing which erupts up from the ocean's surface and explodes into a growing mycelium network blanketed across the sky, each segment connected by a single node. It's an animated and cinematic invitation to consider man-made climate cataclysm and offers a new model for survival in the interdependent and interoperable connective tissue of mycelium. It functioned not just as a multivalent NFT project but also as a project of public engagement/network building (Fig. 11.7). That said, I believe there'll be a glut of superfluous digital layering. We are witnessing this with nonfungible tokens (NFTs); we see this in the art world and with digital media in general. Maybe part of the task for artists is to continue to insist upon these rigorous conversations and continuing to work at scale in a way that insists on, again, the urgency of critical discourse.

JD: You brought up NFTs—another artifact of this conversation is that we're having it in 2021, which is the year that NFTs busted into the mainstream discourse. What do you see as the relationship between AR interventions and NFTs—or maybe more broadly, blockchain-certified art; AR art that trucks in the permanence that blockchain purportedly delivers. Your *Contract Killers* project threads that needle and embraces the possibilities and shortcomings of both AR and NFTs (Fig. 11.8).

NBC: The beautiful tension in that question has to do with permanence and impermanence. So, we think of AR particularly like these interventions as an impermanent happening. The whole premise of blockchain is a type of immutability and permanence. At first blush these would appear to be strange bedfellows. However, I think the conceptual tension between them is exciting—how they can hold each other in contradistinction and be two sides of a coin. I was interested in using the contractual language of blockchain technology to underscore the ways in which immutability was in fact an illusion, that contracts of all kinds were and are broken—and as ephemeral as the AR interventions that highlighted them. And consider what that relationship might be, which is an ontological one.

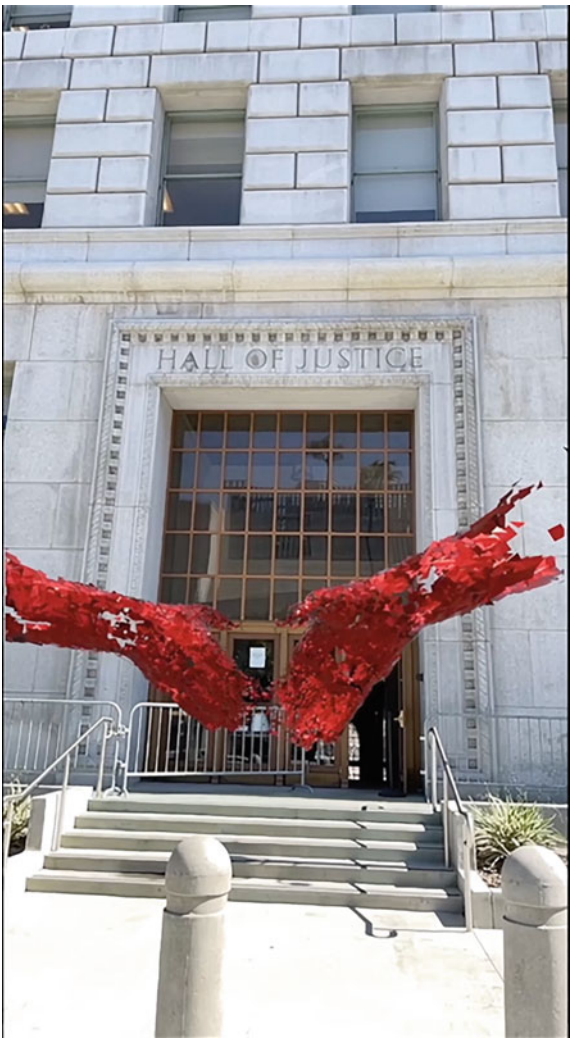

Fig. 11.8 Nancy Baker Cahill, *Contract Killers*, 2019, Los Angeles Hall of Justice, via 4th Wall app

JD: And gets back to your idea of timespace. To adapt a question from our friend and XR oral historian Kent Bye, what do you see as the ultimate potential of augmented reality in shared space?

NBC: I see the ultimate potential embedded in the vision(s) of artists who use the medium in shared space. Curator Megan Koza Mitchell recently covered my work in an academic journal through the lens of what she called "coded power and archeological phenomenology" (Mitchell 2021)—and I hope this critical and thoughtful approach continues among all cultural practitioners. I'm curious to imagine what kind of impact their ideas might have when the technology develops into something more integrated and interoperable. I wonder how generative art will play into this

new landscape, and what will artist/viewer, human/machine collaboration look like in various hybrid digital ecosystems. How we will or will not be influenced by AR when wearables become commonplace and affordable is another abiding question. Most urgently I would love to imagine how we continue to be subversive and innovative as practitioners under increased surveillance, regulation and/or authoritarian regimes. My hope is that as artists interested in using AR in this vein we will remain critically engaged and protopic, and not devolve into helping create the dystopian visual glut so aptly illustrated in Keiichi Matsuda's brilliant "Hyper-Reality" film (Matsuda 2016). In short, it's up to artists.

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Part III
Augmented Reality as a Novel Artistic Medium

Chapter 12
The Aesthetics of Liminality: Augmentation as an Art Form

Patrick Lichty

12.1 Introduction

Since its emergence as an art medium, augmented reality (AR) has developed as a number of evidential sites. As an extension of virtual media, it merges real-time pattern recognition with media, finally realizing the fantasies of William Gibson through goggles or handheld devices. This creates a welding of a form of perceptual vision and virtual reality, or optically registered simulation overlaid upon actual spatial environments. And even though AR-based works can be traced back into the late 1990s, much of this work required at least an intermediate understanding of coding and tethered imaging equipment from webcams to goggles. It is not until the advent of marker-based AR possessing lower entries to usage, as well as geolocational AR-based media through handheld devices and tablets that augmented reality as an art medium would begin to propagate. While one can make arguments that much AR-based art is a convergence between handheld device art and virtual reality, there are gestures that are specific to augmented reality that allow for its specificity as a genre. In this examination, we will look at some historical examples of AR, and critical issues of the AR-based gesture, such as compounding of the gaze, problematizing the retinal, and the representational issues of informatics overlays. This also generates four gestural vectors analogous to those defined in *The Translation of Virtual Art* (see: Lichty 2014a, 445), which we will examine through case studies. Through these case studies, historical and recent to the time of this publication, we may determine the issues of the gestures and aesthetics of AR.

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12.2 The Gaze, the Overlay, and the Retinal

In the creation and "performance" of AR works, there are often two actions in place in relation to the user, and those are of gaze and gesture/positionality. The reason why I separate the two, although related, is that in the five modalities/gestures that I wish to discuss (Fiducial, Planar, Locative, Environmental, and Embodied), each has different relationships between the user, the augment, and the environment. That is, in the experiencing/performance of AR, there is placement of one or many elements between the eye and the recognized target, and the gaze of the agent in experiencing the piece. I will refer to the AR media in question as a "piece" or "installation", as the bulk of this discussion has to do with art, but some exceptional commercial examples will be included. In *The Translation of Virtual Art*, I defined the gestural lines of intent, or "vectoral gestures" as being a line of flight between the origin of the work and the site of the intended audience. These consisted of four modalities, being wholly in the physical or virtual, or gesturing from one to the other (or a combination). AR is a different set of configurations.

The difference inherent in AR from VR is that while there is virtual content, that content is overlaid upon a visual representation of the physical. It would be simple to theorize an intermediate plane of representation between the viewer and the target as in the case of the Planar modality, but unfortunately, AR is not that straightforward. Depending on said modality, there could be a space matrix of locative or interactive media, a space imposed on a marker, as well as one or more spatial planes between the viewer and the target (as in print, which I discuss as the Fiducial and Planar). In addition, there are a number of cases in which modalities overlap strongly (fiducial/environmental, embodied/planar, etc., as I hope to show later).

AR consists of a space of positional overlays, whether locative or recognized, and a performative gestural gaze, especially in the case of headset or handheld/tablet works, as we will observe in Darf Design's *Hermaton.* In addition, I would like to put forth a proposition regarding Duchamp's idea of the "retinal" and an argument for his *Fountain being* a predecessor to augmented art in 1917 with his addition of the signature (Craft 2012, 202). The famous entry of Duchamp's inverted porcelain urinal as work of art inverts the notion of art object, but his signature of "R. Mutt" as a form of augment to the gesture would echo with Manifest.AR's interventions into art spaces like the MoMA and Guggenheim. This comes into play only after considering notions of the gaze and of what I will call overlay space. Before aiming a camera of any sort in media art, the argument of the "gaze" emerges in critical discourse.

In order to address the notion of lensed or gestural view (and perhaps I combine these two together a little casually, they are linked in the case of AR), Laura Mulvey's seminal essay, *Visual Pleasure and Narrative Cinema* (Mulvey 2004, 837–849) comes to mind. In it, she established the concept of the all-objectifying "male gaze" that gendered the vector of the film lens as one between the subject (female) and objectifier (male). However, with the pervasiveness of personal imaging through mobile devices, Queer Theory and other theoretical frameworks have complicated

this discourse. It is for this reason that I feel that as the gaze has been democratized, but manufactured by hegemony, and the "Queering" of Augmented space deserves its own essay (and I am surprised that it has not been written of much to this date). As such, I feel it is beyond the scope of this humble musing, but I will touch on the subject momentarily as an invitation for further discussion.

Since the age of writing *Visual Pleasure and Narrative Cinema*, there are a number of aspects to the human employ of imaging equipment that complicate the gendered subject/object relation. The first, and perhaps an alternative strategy to Mulveyan discourse, is that of personalization of the gaze. With the rise of personal imaging devices, such as iPads and smartphones, the politics of the gaze is bifurcated between the (relatively) "democratized" operator and the hegemonic institution of the manufacturer. While I feel it is more germane to consider the role of the operator in creating the gaze vector or line of sight of the gaze, the manufacturer is important as well. For it is the manufacturer that designs, and if one still believes Bauhaus idea of form and function, it also frames the narrative discourse of the device itself. And as a male-dominant culture, technology may reify Mulvey's assertion of a phallocentric gaze, even to AR, but this may shift in that the design field is more gender equal than Silicon Valley culture. The approval of the design by the manufacturer reinscribes the agenda of the device, and here I believe Mulvey still wields much power. However, my first notion of the locus of the operator is where this discourse diverges from gendered film theory (or at least Mulveyan discourse).

12.3 Queering Augmentation

The closest to the notion of queering of augmented space comes from identity altering apps such as Meitu and FaceApp, and social media using overlay technology such as Snapchat and Facebook Messenger. Meitu's "Cutifying" function, which places the user in a sentimental environment, enlarging the eyes, whitening the skin, and adding lipstick to the face. While the gesture of cuteness can be a symbol of endearment, attraction or latent aggression as Ngai has suggested (Ngai and Adam 2012), online discussions have also questioned the embedding of racist narratives. However, as I have written in *The Mutant Cute* (Lichty 2017), the fact that Meitu is a Chinese program brings forth issues of politics and socioeconomics. This relates to the fact that the effects of Meitu rare as much Asian notions of class, thus making the politics of filtering and augmentation increasingly complex. Likewise, the issues related to the gender/age switching of FaceApp are also problematic as the results have certain gender stereotypes of attractiveness and feature stereotypes for youth/age, etc. But these are more filters than augments. Facebook and Snapchat as such are the first social media sites to incorporate augmentation into their apps. Snapchat, being the first of the two to offer social augmentation, would transform oneself into demons, puppies and wearing fairy tiaras. In fact, my attention was drawn to it by the breadth of users, from porn stars to famous art curators—personal augmentation creates an "other" space that calls into question gender, race, and species. As this is an expansion

of a subject I have felt too large for this chapter, I acknowledge that the alterity of personal semiotic space is expanding under the regimes of augmentation, and as such I likewise call for more study in this area.

12.4 The Semiotics of AR

The semiotic space of AR is peculiar in that it is a potentially fluid one, dependent on any number of factors. Depending on modality, Fiducial, Planar, Locative, Environmental, or Embodied, the relationship of the viewer's position to the subject can be quite relative, interactive, or locative. For example, consider a user in a geolocative installation with, for example, an iPad. Any media is relative to the viewer's location, point of view, and how the infoset overlays itself on the "picture plane" of reality as represented by the device's camera and the AR application. Consider if that media is in itself dynamic if interacted with, the chain of signification separates from what Duchamp called the merely "retinal" and becomes haptic as well. The relationship of the viewer, landscape, and media infoset compounds the point of view through multiple points of interest (POIs) in the landscape, sliding into a Massumian constant state of becoming (Massumi 2002, 37), as the relation of the viewer and the multiple planes of subject constantly reconfigure into their new positionality. These are, at least in the case of locational and interactive AR, the problem of the fluidity of becoming-signification in relation to the landscape/mise en scene. In the case of the planar mode of augmentation, the target is often static and the relation is a simple overlay of the augment over the given recognized signifier. Now that I have at least alluded to the complexities of the relation to media in augmented spaces, their modalities are subject to study.

12.5 The Structure of the Gesture in Augmented Reality Art: Fiducial, Planar, Locative/GPS, Environmental and Embodied/Wearable

Augmented art is actually a catchphrase for at a number of different technologies for overlaying virtual content on actual scenery since the term's coinage by Caudell and Mizell at Boeing in 1992 (Caudell and Mizell 1992, 659–669). In this chapter, I will propose five categories of augmentation, and if any are overlooked, I hope it will be because of new developments since this writing. These techniques consist of the five categories mentioned above, Fiducial, Planar, Locative/GPS, Environmental/Spatial and Embodied/Wearable. While some of these categories overlap or may have indistinct boundaries, such as the intersection of the fiducial and planar recognition, it is hoped that they give the critical scholar studying augmentation a discursive toolset.

Each of these modalities situates the viewer, content, and overlaid environment in ways that create specific gestures of media delivery.

When speaks about gestures in AR, I reference two of my other essays that take a similar analytical approach to examining situations involving virtual media, *The Translation of Virtual Art* (Lichty 2014a, 444–462), dealing with art in virtual reality, and *Art in the Age of Dataflow* (Lichty 2013a, 143–157), which examines the development of electronic literature since Joseph Frank's theorizing the notion of Spatial Literature in the 1940s (Frank 1991). My contention is that there is there is an origin, content, and Arakawa & Gins' concept of a "landing site" (Hughes 2012) for the augmented gesture, which is a destination in a process of communication, but not necessarily a basic sign/signifier relationship. The reason for this is that in AR, although there *can* be these simpler situations between the viewer and media, like planar recognition calling forth video overlays, there are others such as dynamic media in GPS-based/locative installations. These include AR like Richard Humann's *Ascension and* Pappenheimer/Brady's *Watch the Sky*, which I will discuss in the Environmental section. As in *The Translation of Virtual Art*, the AR gesture varies in its relationship between origin and receiver, from double signification in the case of Fiducial and Planar, to a dynamic semiotic matrix of constant becoming-meaning in the case of GPS/Locative applications. What I will attempt to do is to progress from a more basic/historical framing of AR mediations and 2D situations, unpacking the gesture into more complex sites of engagement, with the understanding that there will be some examples that overlap and double themselves within my categories. These categories are presented as propositions that are used as "handles" from which a discussion of the different forms of augmentation can be formed.

The "gesture" as I call it consists of a line of attention/flight between the interactor and the superimposed media overlaid on the given environment, such as attention given to a piece of media situated in 3-space, or by orientation as in the case of fiducial tracking. As one can imagine, the semiotic relationship between the interactor, the environment, and the augment becomes complex, as simple media overlays become multi-faceted interactive experiences to dynamic augmented spaces that can be updated on the fly.

12.5.1 Fiducial AR

One of the earlier forms of augmented reality is that which uses a specific digital, or *fiducial*, marker that gives a unique signature to an objective "seen" by a computer camera. This was the primary form of tracking for the works I first saw in the mid-to-late 1990*s* and especially the work using the ARToolKit and the work coming from ATR Kyoto. The fiducial marker gives information for 6 degrees of orientation (XYZ orientation, pitch, roll, yaw) and locates the AR content easily in 3-space. My first introduction to AR was Berry & Poupyrev's *Augmented Groove* (Berry and Poupyrev 1999), developed at the ATR Kyoto research lab (Fig. 12.1). This work was, in essence, an augmented DJ station in which participants could make audiovisual

Fig. 12.1 *Augmented Groove*, Berry and Poupyrev (1999)

mixes through the manipulation of vinyl albums with fiducial markers printed on them. From the documentary video, the user is presented with a character sitting atop the dial on the record, which changes orientation/values through tilt, rotation, etc. As Berry and Poupyrev write in the work's statement: "The performer modulates and mixes compositions by manipulating real LP records. The motions of the records control filters, effects and samples dynamically mixed in and out of the groove. A composer can assign any element of composition to any record, and simply removing one record and bringing in another controls the song progression. Effects, filters and sample triggering are all assigned to any of the four record movements and can be controlled interactively using simple physical records rather than numerous dials and sliders" (Kaltenbrunner 2003–2014).

Considering this work was conceived in 1999, it radically predates environments like the Music Technology Group's Reactable in Fig. 12.2 (Jorda et al. 2005) and the work being done with "Hybrid UIs" being done with Feiner, et al. at Columbia (Sandor et al. 2005) Groove used an overhead camera, as opposed to the latter piece's use of cameras underneath a translucent table as in the case of the Microsoft Surface tabletop computers. The Hybrid UI interface uses a combination of Microsoft Hololens, Leap Motion controller, and Perceprive Pixel desktop computer (formerly Microsoft Surface) to allow images to be used as markers for a vertical interface structure on the table from which the user can manually pick a hologram from the overlaid interface. Augmented Groove showed the use of fiducial markers as controls, but one of the more popular demos of 3D overlaid media would emerge through videos of demos of ARToolkit proofs of concept using a particular animated character.

Fig. 12.2 *Reactable*, Jorda et al. (2005)

12.5.2 Fiducial AR: The Emergence of Miku

This viral example of a pop-cultural fiducial AR application is the fusion of the free program Miku Miku Dance and AR Toolkit. To understand the confluence of elements to lead to the profusion of videos of "anime" character Hatsune Miku dancing on fiducial marker cards, a little cultural unpacking is in order.

AR Toolkit is the product of Hirokazu Kato of the Nara Institute of Science and Technology in Japan, created in 1999. However, it took 2 years for it to be released by the University of Washington's HIT Lab, with over 150,000 downloads from SourceForge.net, according to that site's statistical tracking (Kato and Billinghurst 1999). It is a series of libraries allowing programmers to orient media to a fiducial marker relative to its appearance through a webcam or other optical input device. By the mid-2000s eligible media included animated 3D content as seen in Fig. 12.3, which leads to the Japanese virtual pop idol, Hatsune Miku.

In many ways, Hatsune Miku is the realization of William Gibson's autonomous virtual pop Idol Rei Toei from his Bridge Trilogy (Williams 2012) in that "she" was released as a character representing a text-to-song program called Vocaloid (Vocaloid.com 2014) by company Crypton, released in 2008. Based on text-to-speech technology developed by Yamaha, Hatsune Miku is the first of a series of Vocaloids to utilize granular synthesis of sampled vocalists (Miku being modeled from the voice of Saki Fujita). What would follow is a series of music videos, especially after the release of *Miku Miku Dance*, a character animation program starring Vocaloid characters, also released in 2008. High points for the Augmented persona in real space would be in Fig. 12.4 large-scale music concert using imagery developed by UK company Musion, which would also reflect Digital Domain's *Virtual Tupac*

Fig. 12.3 *Miku Hatsune AR*, late 2000s

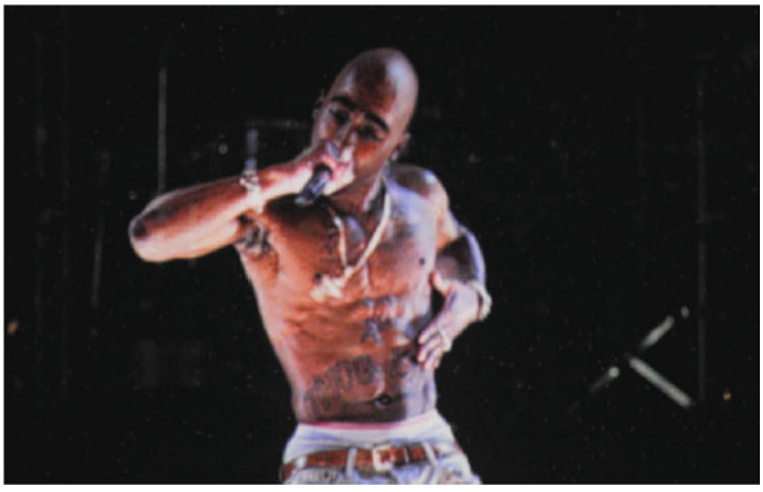

Fig. 12.4 Virtual Tupac (Image courtesy Digital Domain 2012)

spectacle at Coachella 2012 (Verrier 2012) and large-scale performances based on the Miku genre, such as "Still Be Here" at Berlin's Transmediale festival in 2016 (Fig. 12.5).

The virality of the Miku/Vocaloid technology made her an ideal subject for an AR companion. Since 2009, numerous Hatsune Miku demos based on fiducial markers on paddles would arise, even to the point of applications using the Oculus Rift headset to let you "live" with or sleep alongside Miku. This is more in the realm of what this essay terms as the Environmental or even Embodied/Wearable gesture of AR. This is a step more advanced than the GPS/Geolocative, placing the augment in space through *environmental feature* recognition rather than accessing and external GPS database of Points of Interest (POIs) linked to associated media.

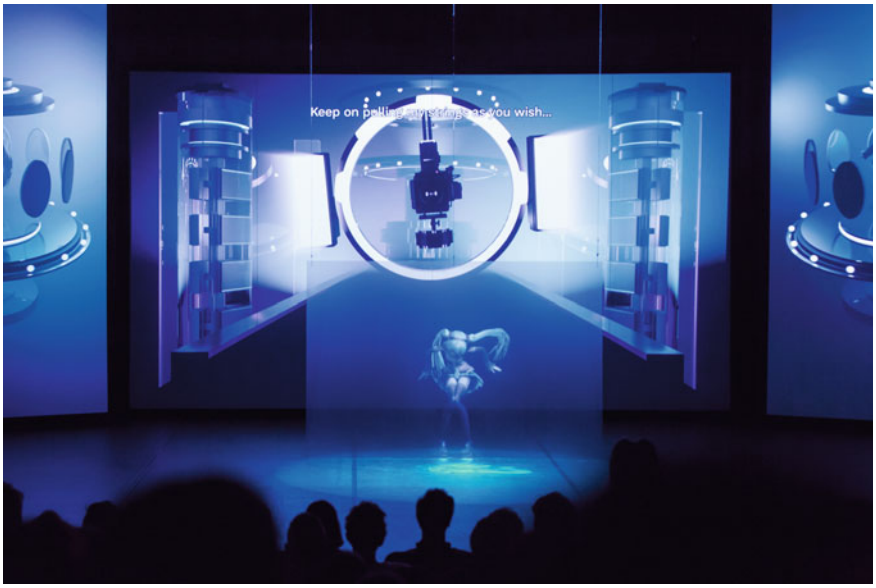

Fig. 12.5 Miku Hatsune *Still Be Here* (Courtesy Ars Electronica)

New York artist Mark Skwarek created novel uses for the fiducial marker on the body. The first example is the *Occupy Wall Street AR* project, (Skwarek et al. 2011, see Fig. 12.6) which was a political intervention by collective Manifest.AR. This intervention took place *in front of* the Stock Exchange, which is unique in that interventions and protest were only allowed in Zucotti Park. The intervention was docented, as passersby were invited to don a helmet with a marker, and when the wearer views himself or herself with the front-aiming camera, they would see the engraved portrait of Washington from the US one-dollar bill instead of their head. Skwarek would reprise this gesture in creating markers for "Virtual Halloween Masks" (Poladian 2013), where anyone could download a given marker and app, and suddenly appear with a skull or jack-o-lantern head (or in their hand or wherever the marker would be placed). These are both wonderfully playful applications of the fiducial gesture. One other artist has used the Fiducial and the Recognition gestures in his performance work and presents segues between these gestural modalities.

Jeremy Bailey (the "Famous New Media Artist") is a Toronto-based "Artist" who uses markers-based AR in strange and unexpected ways. As Skwarek's placement of the marker on the body induced a straightforward semiotic swap, Bailey makes peculiar formal translations. His *Video Terraform Dance Party* (Bailey 2008), performed in Banff, Alberta shows him bobbing his head around, sculpting a virtual island and populating it with virtual birds and citizens as he narrates their creation. In Fig. 12.7, Bailey remaps his entire face as a faceted television with three "channels" that he controls with the tracking of facial markers that he tries to communicate while describing the piece through his stuttering, self-effacing banter in *The Future of*

Fig. 12.6 *Occupy wall street AR mask* (Courtesy Mark Skwarek 2011)

Fig. 12.7 *The future of television* (Image Courtesy Jeremy Bailey)

Television (Quaintance 2013). There are awkward moments, as he calls up a strobing stream and calls it "The Epilepsy Channel", and then thinking better, he tries to "save" and switches to portraiture of his wife. Bailey then slides into the Planar/Recognition modality with his *Important Portraits* (Smith 2013), which was a Kickstarter project that became a gallery exhibition at Pari Nadimi Gallery in Toronto. He invited "important" patrons to fund the project for a show in which he would use dramatic portraits of the funders as planar markers for dynamic geometric augments. Bailey provides a segue and is important in his manic usage of AR modalities somewhere between a

Japanese Mecha Epic and baroque portraiture that has moved from usage of fiducial markers to facial/feature recognition that is hard to categorize.

12.5.3 Planar Recognition AR

Although similar to the idea of the fiducial marker in that it exists on a surface of some sort, the gesture of the planar/feature recognition augment exists as a superset of the Fiducial modality. The Fiducial was specified for its historical significance, but the planar/print/poster form of AR exhibits a broader scope than the digital marker, and in popular media, often performs a more straightforward function. In a TED talk presented in 2012 by the makers of the Aurasma AR technology (Mills and Roukaerts 2012), Matt Mills and Tamara Roukaerts demonstrate the recognizing gaze through aiming a mobile device at an image of the Scottish poet Robert Burns, as in Fig. 12.8. By scanning the image, a perfectly overlaid video of an actor, approximating the trompe l'oeil of the painting, appears and begins to orate. While more sophisticated than the fiducial gesture, AR feature recognition of media is often an overlay of content onto print media. Other examples are of an IKEA AR experience, and even Fingerfunk's *Alien* chest burster experience which tracks from a t-shirt image (Woermer 2012). All of these augments are, in this writer's opinion, either simpler than or at best equal to a fiducial, creating a simple semiotic swap, however lurid or graphic.

Esquire Magazine also uses this technique in a famous example in its Augmented Reality issue in 2009, "graced" on the cover by *Iron Man* star Robert Downey, Jr., as illustrated in Fig. 12.9. What was unique about this issue is not only the fact that the fiducial markers summoned a mass of entertaining media through the issue, but

Fig. 12.8 *Matt Mills' TED talk demonstrating Aurasma technology* (Image Courtesy Aurasma 2012)

Fig. 12.9 *Activated esquire AR issue cover* (Image Courtesy Esquire Magazine 2009)

reorienting the markers would elicit different responses. Turning the marker sideways would cause Downey Jr. to lounge on his side, playing the raconteur in another way, cause the fashion models to be represented in another season, or call forth another "Joke Told by a Beautiful Woman". This publication used the potential of the fiducial and planar gestures extremely well in not using the orientation of the marker as for mere orientation (tilt, rotation, etc.). The Downey issue was an initial example of what is now a fairly common marketing application of AR.

As interactive interfaces emerge in all AR technologies unique possibilities. But as we unpack the representational modes of AR outward from interacting with planar media, the user encounters AR in spaces. This is where the modalities of Environmental, Geolocative, and Embodied/Wearable AR come into play. The difficulty with studying these forms of mediation and interaction is that they both engage space in different, but equally valid ways. Because of Environmental recognition being closer to the Planar/Fiducial than Geolocative and Embodied AR, this will be our next category.

12.5.4 Locative/GPS-Based

The last gesture/modality in AR, and the most complex, is that of Locative/GPS. This is due to the dynamic relationship between the user, the media linked to points of interest in the landscape, and the objective background upon which the media is overlaid. Many variables are in play as the relationship between user, media and landscape as with the Environmental modality, and dynamic content creates a fluid matrix of representations, creating a sort of semiotic pinball machine. Fortunately

for our analysis, and perhaps disappointingly for the work itself, most locative AR work consists of overlaid imagery or video on static POIs (Points of Interest). This author understands, as with all our gestural modalities that there are commercial applications, like the fiducial application used in the Esquire Magazine issue that have surpassed many of the artworks in our discussion in leverage of the potential of the medium. In addition, locative AR art constitutes the majority of the medium, so only a brief number of works will be discussed here, and apologies to the mass of work in this gestural realm that is elided. For purposes of interest, I would like to discuss installations that address certain topics—politics and geographical annotation. Each throws content in useful or illegal/unexpected places and creates a double signification of the location through overlay and context.

Political work is one of the smaller genres in AR, although interventions like *We AR MoMA* (Sterling 2010) have used AR to create salons des refuses inside prestigious museums without actually sneaking into the space and nailing the work to the wall. Figure 12.10 *Occupy Wall Street AR* (Holmes 2012), organized by Mark Skwarek for the collective ManifestAR, inserted technically illegal content over the Stock Exchange. The illegality of the gesture is marked by the fact that during the Occupy Wall Street campaign, intervention was only permitted in Zucotti Park, as it private property. So, collective members (Mark Skwarek, Alan Sondheim, et al.) "docented" the work to passersby, which included flaming bulls, Space Invaders, the Monopoly game plutocrat, and slot-machine wheels between the columns of the Exchange, playing on Brian Holmes assertion of "Market as Casino" (Holmes 2012). What I feel was unique was that the Occupy AR interventions are an art intervention where the "infopower" is not constrained by material or as I call it,

Fig. 12.10 *Occupy wall street AR* (Image Courtesy Mark Skwarek 2012)

Fig. 12.11 *Love bombers* (Image Courtesy Patrick Lichty and Mark Skwarek 2012)

"atomic" power (Lichty 2013a; b, c, 53). As mentioned in a 2013 panel on AR as Activism at the festival South by Southwest, the question was posed as to whether law enforcement could demand the reorientation of a locative database if it was representing protest in a restricted space. This question was revisited as this author also penetrated controlled airspace with *Love Bombers*, in which Fig. 12.11 depicts NATO A-10 Warthog Ground Support Bombers, dropping video game 8-bit hearts on the NATO summit in Chicago and the corresponding protesting mobs.

Two other AR augment works that overlay historical content onto geographical environments are Annette Barbier & Drew Browning group collaborative project 2012 *Expose, Intervene, Occupy (EIO)* (Tripp 2012). *EIO* used locative and recognition technologies to insert critical narratives into the downtown Chicago landscape. Examples of the eight AR collaborations include Barbier's *2070* as seen in Fig. 12.12, exploring the progressive invasion of the Asian Carp into the North American Great Lakes through the Chicago River, an alternate historical street sign narrative, and a Mario–Bros. romp by Mat Rappoport that invites the interactor to chase coins through Chicago's Financial Sector in Fig. 12.13. Two other conversational pieces are *PolyCopRiotNode* by Adam Trowbridge and Jessica Westbrook that features an ominous cybercop, commenting on the law enforcement culture of Chicago, and *WeathervaneAR* by John Marshall and Cezanne Charles that has many instances of a "robotically driven" chicken head, playing of post-Millennial paranoia. Where the *Occupy AR* series had more of a unitary format, *EIO* creates an "anthology" of works describing how AR can be used as a tool of psychogeographic inquiry. Of note is the unfortunate fact that due to the change in policy of companies providing the technological infrastructure for the work (similar to the removal of non-profiting movies from blip.tv in December 2013) *EIO* is now inactive.

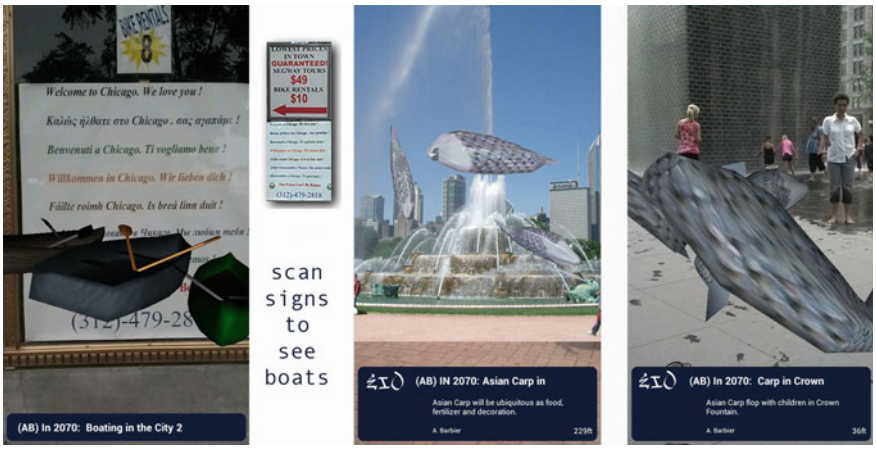

Fig. 12.12 *EIO: 2070* (Image Courtesy Annette Barbier 2012)

Fig. 12.13 *EIO: Coin Chase* (Image Courtesy Mat Rappoport 2012)

Lastly, I want to mention another participatory and political work *Watch the Sky* (Fig. 12.14), by Pappenheimer/Brady. It uses GPS and a web based input to suggest a larger Harlem Watchtower in Marcus Garvey Park in Harlem, NYC. As Pappenheimer states, "It projects the need for a future much taller structure, "Harlem Watchtower+", to survey the global affects of anthropologist Arjun Appadurai's technoscapes as they intersect with other dimensions of the current multi-valent landscape in flux. Thus the original fire watchtower extends its functions to global vigilance and wide ranging critical views as influences on the local neighborhoods and events" (Pappenheimer 2016).

It also uses a mobile app to invite participants to skywrite in AR over the Garvey park site. The project invites public commentary while using public architecture as

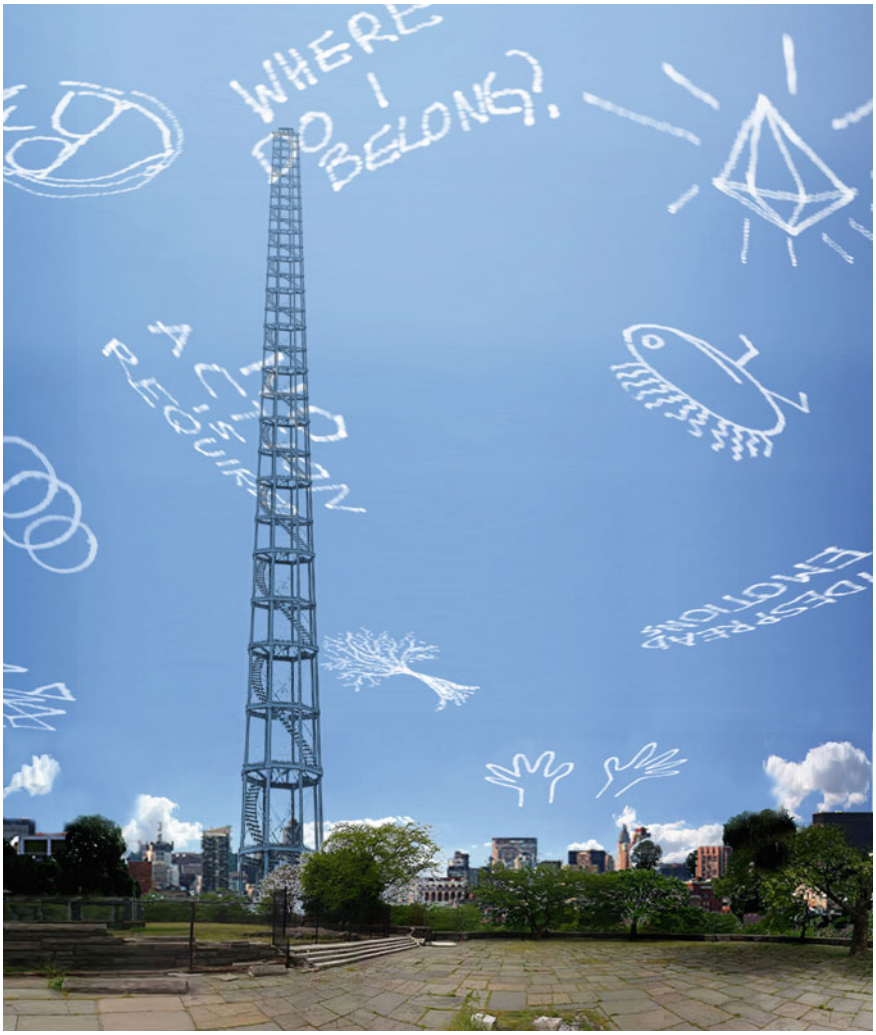

Fig. 12.14 *Watch the Sky* (Image Courtesy Will Pappenheimer 2016)

political commentary, both historically (the fire watchtower) and contemporary (the notion of vigilance and surveillance in the age of political strife in the USA). In some ways, this reflects works like Nathan Shafer's *Seward's Success,* based on unrealized megastructure plans in Anchorage, Alaska to comment on the human and political landscape of a given site.

12.5.5 Environmental/Spatial Recognition

The next challenge that arises from recognizing an image as a fiducial marker is that of recognizing a space from a given point of view. This introduces any number of problems, from perspective to time of day, weather, or occluding bodies in the scene, such as vehicles or other bodies. This has largely left the application of environmental AR to indoor applications that have fewer variables. Of course, outdoor applications in regards to machine repair are part of the original Boeing concept and military applications (Caudell and Mizell 1992, 659–669), but these are close-range situations with very specific, regular spatial configurations. Environmental/spatial recognition applications at the embodied or the architectural scale can present more variables and present challenges in regards to tracking the environment. For the purpose of discussion, I will present examples that will expand in size and explore a couple examples of intimate environmental experiences that refer to earlier examples in this essay. I will begin with that I feel is still one of the best environmentally based AR game/apps, Hermaton by Darf Design.

Hermaton (Holmes 2013) is an environmental AR game developed by London-Based Darf Design, founded by Sahar Fikouhi and Arta Toulami that uses a half room-sized cut vinyl mural as marker when presented at an environmental size. There is a "tabletop" version that uses its own marker that fits very well into an advanced category of the feature recognition category, but for the sake of our conversation, the room-sized version in Fig. 12.15 is more germane. As their project statement describes *Hermaton:* "The project uses a buzz wire maze (think: the children's game "Operation") which people can navigate through in real-time, attempting to interact with the digital objects of the "Hermaton" machine. The design of this environment provides both an interactive and performance space which allows the user to fully immerse in a new augmented physical landscape" (Fikouhi and Toulami 2013).

The user controls a small red ball through the maze-like machine, switching on its lights, and progressively activating the *Hermaton.* In addition, the user is placed in what I would call a "performative" media space (Lichty 2000, 352) where the

Fig. 12.15 *Hermaton* (Image Courtesy Darf Design 2013)

body has to physically stretch, crouch, and twist through the virtual machine. Where I draw the line between performance and performativity in media art, including AR, is the implication of audience in experiencing the piece. In the case of environmental AR, there is a becoming-action in navigating the work, but the existence of audience in the space or not is purely incidental, but there is activation of the space.

Another example of environmentally based AR works are Richard Humann's *Ascension* project. *Ascension,* based on the Membit AR platform is a mix of environmental and planar AR art (Fig. 12.16). In installations in NYC and during the Venice Biennalle, Humann reenvisioned the constellations of the night sky. This was done by placing images that recognize a certain view and perspective as a site of image recognition for Humann's new mythologies. Instead of merely taking captured images and placing them at the GPS coordinates with the proper orientation, Humann edited them and replaced them with the constellated images. As Membit founder Jay Van Buren says, the technology was originally meant to leave memories, but it can also be used to leave things that never were, which is a provocative element of AR. (Membit 2017) One is led to wonder of the veracity of simulations in the landscape in the age od "Fake News", as one person's satire has become another's reality hack.

Another larger-scale VR object is the author's *The Kenai Tapestry* (Fig. 12.17). Although smaller, the 5-by-21 foot Jacquard-woven textile is a panoramic composite

Fig. 12.16 *Ascension* (Image Courtesy Richard Humann 2017)

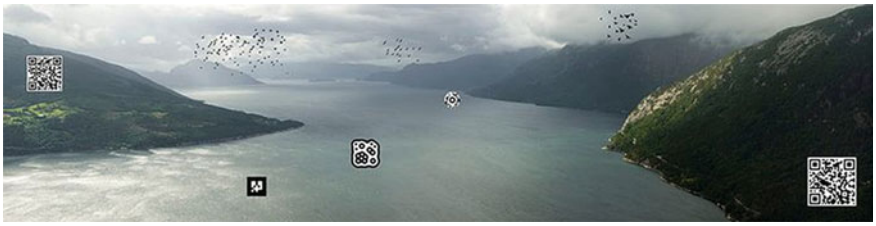

Fig. 12.17 *Kenai Tapestry* (Patrick Lichty 2014b)

of online and actual photography taken by this author from a 2009 photographic project in Alaska on the Kenai Peninsula and Adak Island. The piece refers to instruments of power such as the *Bayeux Tapestry*, which depicts the Battle of Hastings, and the culturally transformative nature of the Jacquard Loom at the turn of the nineteenth century much in the way globalization and mechanization do today. The 5-by-21 foot size is appropriate for depiction of the grandeur of the Alaskan landscape. For augment tracking, it uses QR codes as web links or fiducial markers, and features like bird flocks and sunlit highlights as recognizable features. The content (doubly accessible in the case of the QR Code) refers to the artist's experience of the Alaskan environmental embarrassment of riches while forces such as oil and mineral industries and global worming encroach this remote part of the world. *Into the Wild/Virtual Kenai*, in its own way, depicts another form of conquest that is the Enlightenment-era notion of the human subjugation of nature, currently termed as the Anthropocene Age (Crutzen and Stoermer 2000, 18). In this way, this work frames itself in a historical context while still forming a critical stance. But other applications root themselves even deeper in history and reveal exciting potentials for the illustrative power of environmentally based AR.

Nathan Shafer's *Exit Glacier Terminus AR* shown in Fig. 12.18 reveals a history of the retreating terminus of the Exit Glacier on the Alaskan Kenai Peninsula. *Exit Glacier*, created for interpretive rangers with the Kenai Peninsula National Park, is a unique application that specifically recognizes the terrain from its own database, as there is little data connectivity at the site, and had to use its own tenuous Wi-Fi transceiver. Exit Glacier is also unique in that it is one of only two walk-up glaciers, and the AR application will show five distinct reconstructions of the glacier face from 1978 to 2013. The challenge connectivity problematizes the project with most AR frameworks. But conversely, the project's ironic Alaskan self-sufficiency presents a certain kind of utility that is particularly useful at the edge of the wireless world.

Fig. 12.18 *Exit glacier terminus AR* (Image Courtesy Nathan Shafer 2013)

12.5.6 *Between the Environmental and Embodied: The Return of Hatsune Miku*

In this section, the AR applications depicted have ranged from interior architecture to the geologic, but a peculiar subset of environmental applications have emerged in Japan, based yet again on our virtual pop idol, Hatsune Miku. I place them between the environmental and the embodied/wearable modalities as they entail both a Kinect-like spatial camera linked to the headset, making them embodied, but specifically about orienting the subject in the environment. The subject in question is Miku herself, and the applications are *Miku Stay*, a series of experiments to have Hatsune Miku as a happy, live-in girlfriend, and another to take the interaction one step further and situate Miku as a sleeping partner.

In *Miku Stay* (svx 2013), created by a YouTube member named "alsione svx", Miku exhibits complex interactions like walking up to the viewer in a park as in Fig. 12.19, walking around a kitchen, and sitting in a chair (and impressively dealing with occlusion by walking *behind it*) and holding hands. Most of these are accomplished through spatial camera and fiducial markers, but eventually alsione svx mentions that he can't stand using these any more in the video, so he uses environmental cues such as the chair as a marker. She comes over, stands on the bathroom scale, holds hands and then jumps around laughing merrily. *Miku Stay* is a feminist's nightmare, as the app allows the user to live with a hopelessly idealized "waifu" creating expectations unattainable by flesh and blood. If this were not problematic enough, the *Sleep Together* app (*Miku Miku Soine*, Fig. 12.20) by Nico Douga (Tackett 2013) takes this one step further, as Miku becomes the user's bed

Fig. 12.19 *Miku stay in park* (Image Courtesy "alsione svx" 2013)

Fig. 12.20 *Miku Miku Soine* (Image Courtesy Nico Douga 2013)

partner, calling them "Master" and comforting them if there is restlessness in the middle of the night.

Awkward at this may seem, if we return to the gesture of locating the subject in space using environmental AR, we find that there is a *second* Miku-as-AR-girlfriend game for the PS Vita, entitled *Hatsune Miku Project Diva F* (Tolentino 2012). The "song-masher" game (as I call the genre of musical coordination games from *Dance Dance Revolution* to *Guitar Hero*) includes a markerless AR app that allows Miku to hang out in your apartment, as seen in Fig. 12.21, and sit on your bed. Is this the isolate hikikomori's dream, or as Josh Tolentino states in *Japanator*, "Mindless waifu ("*waifu*" being a fan term for idolizing an anime character as a possible mate) gimmickry." *Hatsune Miku Project Diva F* is definitely in the area of Environmental AR, but in all these examples, the question remains whether AR suggests what Bruce Sterling calls a "design fiction" (Sterling 2013) to alleviate technological isolation? As a note, in March 2017, the *Gatebox* Virtual Robot project (as in virtual "wife") announced that it would be releasing a Hatsune Miku version of its product

Fig. 12.21 *AR Shot from Hatsune Miku Project Diva F* (Image Courtesy Crypton, Sega 2013)

shown in Fig. 12.22 (Crunchyroll 2017). It would allow the user to "live" with the character, trade SMS texts during the day, and have her control the lighting, etc. of the apartment. Although the Gatebox does not represent an AR application as such, it does talk about desires for us to live telepresently and with virtual companions and draws sharp questions about the role AR will play in our interpersonal relationships.

Fig. 12.22 *Gatebox Hatsune Miku* (Image Courtesy Gatebox, 2017)

12.5.7 Body as Landing Site: Wearable AR

In my 1999 essay, *Towards a Culture of Ubiquity* (Lichty 2013c), I trace a trajectory of where interaction/delivery of media/mediated reality would be situated. First is the screen, then into the hand(held) device, then onto the body, and then onto space and architecture. Although wearables and locative technologies have happened far more in parallel than I envisioned, the general trajectory seems on track. There are multiple platforms are overlapping, such as the Epson Moverio/ODG/Microsoft Hololens and Meta platforms, and have supplanted the long dead Google Glass platform. In *An Alpha Revisionist Manifesto* (Lichty 2001, 443–445), I theorize many years prior to this writing, in the future, companies will create pre-prototype narratives and what Sterling would term as "design fictions" to inspire the funders, developers and consumers into willing their dreams into being. Of course, in the mid-2010's this manifested itself as slick, slightly overpromising promotional videos of the coming platforms. In many ways, they reflected the tropes in current science (or near-future speculative) fiction, as we will see below.

In popular culture, the world of AR has given way from science fiction to design fiction, although there are excellent examples of AR as trope in books like William Gibson's *Spook Country* (Gibson 2007, 8), which features a subplot about AR artists depicting the deaths of celebrities at their place of demise. There are plenty of examples in movies as well, such as *Minority Report's* dressed-up version of Oblong's user interface (Underkoffer 2010). However, as it seems, science fiction is giving way to "design fiction" as a way to capture the popular near-future imaginary. The leading design fiction in 2013 involving the embodied AR gesture, and ironically, the ultimate "chick device" (and I use that phrase with a healthy dose of derision) is *Sight* (Sakoff 2012), a dystopic AR fantasy by filmmakers Eran May-raz and Daniel Lazo. The opening scene finds our protagonist, Patrick, mime-flying in an austere room. In the next shot, we switch to his eyes, which have been equipped with Sight Systems' lenses, which show him playing a flying obstacle course. "Sight" technology has apparently revolutionized life as we know it, from augmenting the contents of the refrigerator to making such mundane tasks as frying an egg or turning cutting vegetables into a "Master Chef" game. The story turns darker as in Fig. 12.23, Patrick goes out on a date, using Sight to choose the ideal wardrobe and social approach using his "Wingman" app. After making a few initial gaffes, Patrick wins his date over, and we find out he is, in fact, an interface engineer for Sight Systems itself. They go back to his apartment for a nightcap, and his date notices that Patrick forgot to turn off his scoreboard on the wall, and sees that he has been using the Wingman, and storms off. This is actually not a problem, as he reveals that the secret feature of Sight is to be able to hack consciousness itself,

This is also similar to a 2016 episode of the serial *Black Mirror* called *Playtest* (Fig. 12.24), in which a thrillseeker, accepting a job with game company SeitoGemu, experiences a neural interface AR system that inadvertently accesses the recesses of his psyche and renders him psychotic. (Brooker 2016). This is where my axiom that most authors should not write their last chapter. This is due to the fact that

Fig. 12.23 *Sight* (Image Courtesy Eran May-raz and Daniel Lazo 2013)

Fig. 12.24 *Black Mirror: Playtest* (Image Courtesy *Channel 4 Television*)

although Sight and SeitoGemu offers marvelous insight into the probable future of embodied AR, the worn trope of mind control sneaks in. It is also a commentary of technoculture's growing distrust of Sterling's notion of the five global vertical monopolies he calls "the Stacks" (Madrigal 2012), as *Sight* is an obvious commentary

Fig. 12.25 *Hyper-Reality* (Image Courtesy Keiichi Matsuda)

on Google Glass taken to its logical extent. The irony of this is that with the advent of Snap, Inc's *Spectacles,* for Snapchat, there has been little reaction to this device, perhaps due to its more "friendly" corporate profile.

In the world of art, the speculations are conversely much wilder and more constrained. Keiichi Matsuda's *Hyper-Reality* (Fig. 12.25, Matsuda 2016) shows a near-future scenario of a contingent worker in Medellin, Colombia, doing menial jobs for "loyalty points". Her visual field is constantly polluted with game-like challenges, here virtual Shiba Inu puppy, offers a gig job and encouragement from her virtual coach. She struggles through the hypermediated landscape until an identity hacker stabs her in the hand stealing her points. Juliana, the protagonist, in desperation, finds the nearest shrine and becomes a Level One Catholic.

But the realities of wearable AR art are far more modest at this time, and apparently involve mind control or cybernetic psychosis. Artsy and Pace Gallery's Studio Drift through curator Elena Soboleva teamed up to create a work called *Concrete Storm* for the 2017 Armory Show (Fig. 12.26, Burdette 2017). It is a mixed reality installation with concrete constructions that act as registration points for the augmented sculptures. As the used wears the HoloLens, they see the physical components of the installation as well as the augmented concrete pillars, that the users can manipulate, break and build. Although this is a relatively formal piece, this is a good example of early "Holographic AR" art.

Fig. 12.26 *Concrete Storm* (Image Courtesy the artists)

Fig. 12.27 *The Alices Walking* (Image Courtesy Claudia Hart)

12.5.8 Next Steps: Mixing Metaphors/Mixed Realities

Claudia Hart's *Alices* body of work (Fig. 12.27, Hart 2014) is one in which I hesitate to place into any of the previous areas because of its intermedia nature. Her use of fiducial markers on ceramic plates, on bodies in motion, and in VR place her close to the genres of fiducial and environmental recognition. But the use of AR in gallery, environment, and performance situations make the work unique in that AR is not a focus, but a facet of the work. From plates and napkins in *The Looking Glass Collection*, which place a reclining odalisque over the viewer's meal to *Alices Walking*, an Edward Campion-scored performance in which performers wear planar markers that are activated with the artist's smart device app. In *Alices Walking*, the markers reveal the hidden narratives of the performers, such as "I wonder if I have been changed?". Also, motifs from the ceramic work reappears, creating a pastiche of reflections on "… how queer things are today."

Hart's work is unique in terms of its multimodality—AR and its representative function is not the focus of the work but an aspect. AR is not the primary mode of delivery, but an aspect. In this way, this work escapes the genre as technofetishistic site and enters the zone of aspect of *gesamtkunstwerk,* which erases the focus on the viewing device. The use of AR in performance, as well as in public action, activates the form to something beyond a technological attraction.

12.6 Conclusions

By looking at augmented reality as a delivery method for artistic content, then investigating it as a frame for mediation, a discussion is opened up that ties deeply into art-historical tradition and novel modes of "becoming". From Duchamp's notion of the "retinal" to Mulvey's masculinization of the gaze and pervasive imaging's fracturing and possible "queering" of the mediated gaze, AR and my proposed gestures/modalities of representation suggest ways in which artists are using AR in service of cultural production. By beginning with historical technologies like fiducial tracking, we can trace an epistemic arc as AR unfolds into image recognition, spatial location, and embodied interaction. Additional layers of interaction are embedded into AR in the handheld and wearable units, more layers of signification are stacked into augments. However, it is also important to note that AR as of 2014 is still a medium in its adolescence, as technologies in an "Alpha Revision" state rely on design fictions and crowdsourced bootstrapping to will them into being. This decade-later extrapolation of my idea of Alpha Revisionism has culture in a state where science fiction begins to pale in light of propositional videos and developer kits for *Star Trek*-like devices. In conclusion, it is this author's hope that he has left points for further discussion, made a discursive framework for the genre, and set up a number of propositional qualia for the study of augmented reality. In my first edition of this essay, I had hoped for the datedness of technological speculation to keep the

essence of the principles of this essay, except for advancement of the technology and the creation of a larger historical framework, the primary tenets here remain. Again I hope that the ravages of time remain minimal as the genre of AR moves forward and the conversation continues.

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Chapter 13
Augmented Reality in Art: Aesthetics and Material for Expression

Geoffrey Alan Rhodes

13.1 Introduction

This essay proposes a question: What would be an avant-garde augmented reality art? And how can we get there? The objective is a genre of artworks using augmented reality that challenges the underlying technical and ideological AR structures, the same way structuralist film stimulated audiences through challenging cinema: a contemporary high-tech art that can free thought by pulling apart and revealing the structures of the technology in which we live. This essay will follow a thread through cinema apparatus, video art, and augmented reality that points a way forward.

13.2 Film

Stephen Heath begins his introduction to the collection of essays, *The Cinematic Apparatus*, with an observation on proto-cinema advertisements:

> In the first moments of the history of cinema, it is the technology which provides the immediate interest: what is promoted and sold is the experience of the machine, the apparatus. The Grand Café programme is headed with the announcement of 'Le Cinématographe' and continues with its description: 'this apparatus, invented by MM. Auguste and Loius Lumiére, permits the recording, by series of photographs, of all the movements which have succeeded one another over a given period of time in front of the camera and the subsequent reproduction of these movements by the projection of their images, life size, on a screen before an entire audience'; only after that description is there mention of the titles of the files to be shown, the 'sujets actuels', relegated to the bottom of the programme sheet. (Heath 1980)

The context here, in a compilation of essays inspired by Jean-Louis Baudry's essay "Ideological Effects of the Basic Cinematographic Apparatus," is after sixty

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years of critics analyzing film on the basis of dramatic text, aesthetic composition, photographed subject, and psychology, Apparatus Theory in the 1970s had finally codified an analysis of cinema based on its essential unique elements—an analysis based on cinema's material for expression or medium. In Baudry's 1970 essay, he draws a diagram of the "cinematographic apparatus" delineating the path that spectators' perceptions normally travel, noting what is emphasized and what repressed. I redraw it here in Fig. 13.1.

The text in the diagram notes elements of the apparatus: the cinema screen, the projector, the montage/cutting of the film, the principal production of sound and film, the screenplay, and the photo-emulsion-captured images of objects in past reality. We could add many more elements that make up the film: the dramatic acting, the framing, the soundtrack and sound looping, the business machinations which create the theaters and distribute the film, etc. The solid line draws the actual path of the cinema information, from staged scene, to framed shot on film, to the editing room, projector, and cinema screen. The dotted line draws spectators' perception of

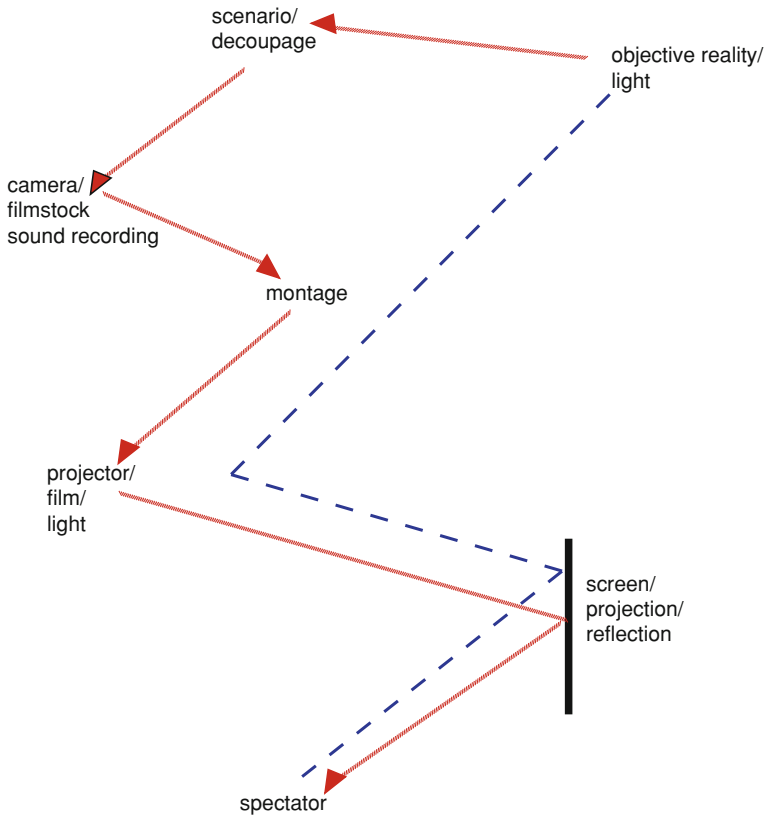

Fig. 13.1 Cinema apparatus (Baudry 1986)

the film: that of which the spectator is aware. Many of the apparatus elements are repressed in favor of "suspension of disbelief" and "persistence of vision" in the cinema experience.

In Baudry's diagram, he emphasizes the analogic quality of cinema; he draws the dotted line to describe spectators that feel like they are seeing the actual captured objects—not seeing a picture of a car, of a beautiful face, of a camel crossing the desert, but seeing a present car, face, and camel. The viewer is still conscious of the filmmaking, but the dotted line represents the extent to which these different elements are actively present in the mind of the spectator. Film audiences are mostly aware of the objects and the screen presenting them, and much less so the other apparatus that deliver it there. It is a sketch of the cinematographic ideology.

In his drawing, we the spectators remain aware of the screen—if not, then we might run from the theater when a dinosaur enters frame or a gun is shot. Less so are we actively conscious of the projector and the beam emanating from it—if dust or smoke obfuscates the beam, or if the film shakes in the projector gate or even burns up, then this drawing attention to the projector would be a failure that "takes us out" of the experience of the movie. Though vaguely conscious of the editing, we are almost completely unconscious of the filmstock and technical sound recording choices—if these things are noticed at all, it is a failure of production, such as in cheap B-movies where there are jarring changes between film stocks with different grains or scratchy soundtracks. And the same can be said of the scripting and acting—once we notice the acting of the drama or the scripting of the drama, we are no longer *in the drama* where we are supposed to be. And while watching the film, we are almost completely unaware of the larger *dispositif*: the business operations of the studio, the transport operations of the cinema, and the entertainment economy that has resulted in this film being presented on this screen.

Artists contemporary with Baudry subverted this standard perception through different techniques. They sought, through the elements repressed within the cinematographic apparatus, a fresh material for expression: a material essential to cinema capable of an avant-garde film art. Anthony McCall created films that emphasized the projector beam. Stan Brakhage made films that emphasized the interaction of the projector light and the material of the film strip itself. Flicker filmmakers like Tony Conrad and Paul Sharits created metrical montage films that emphasized the cutting and rejoining of film strips and their mechanical movement through the projector light. Filmmakers like Jonas Mekus, Kenneth Anger, and Jack Smith made avant-garde films that turned upside-down the emphasized and repressed areas of production, scripting, and performance. Avant-garde film sought to rupture the ideology inherent in the cinematographic apparatus and create a fresh image capable of inspiring new thoughts, emotions, and politics.

This achievement is what we seek for AR.

13.3 Video Art (Live)

Avant-garde film art was achieved in the television era. At that time, in a newly wired world, a media art and philosophy that could address technological connections and circuits were exciting and important. And, perhaps, there are special opportunities for critical perception in times of technological revolution. McLuhan in *Understanding Media* makes the analogy of sound waves becoming visible just as a plane approaches the sound barrier like a medium revealing its nature when it is technologically transformed:

> The sudden visibility of sound just as sound ends is an apt instance of that great pattern of being that reveals new and opposite forms just as the earlier forms reach their peak performance. Mechanization was never so vividly fragmented or sequential as in the birth of the movies, the moment that translated us beyond mechanism into the world of growth and organic interrelation. The movie, by sheer speeding up the mechanical, carried us from the world of sequence and connections into the world of creative configuration and structure. (McLuhan and Gordon 2003)

It is easy to project McLuhan's analogy forward and wonder what insights for electronic video can be found in our new digital-interactive era that accelerates the connections of electric images.

Video art is typified by its technical structures. Like the proto-cinema program cited by Stephen Heath, video art in the gallery is frequently defined by its apparatus—the apparatus locates the genre. A Bill Viola video work, represented on James Cohen Gallery's Web site, describes the artistic material, "Color High-Definition video triptych, two 65" plasma screens, one 103 "screen mounted vertically, six loudspeakers (three pairs stereo sound)" (for the work, *Ocean Without a Shore*, 2007). SFMoma, in their Web catalog, gives the genre or medium of Peter Campus' 1975 video artwork *Dor*, "closed-circuit color video installation," but to truly locate the work they further note, "A discreet video camera is placed near the entrance, filming visitors entering and exiting the space; their live image is projected onto an adjacent wall." In description, these are not video works primarily made of subjects, scenes, or even images, instead they are configurations of wires, capture devices, and rendering screens.

In 1976, as video art became prominent in the art gallery scene, Rosalind Krauss published her well-known essay, "Video and the Aesthetic of Narcissism," which addressed many of the new video works, including the above-mentioned *Dor* by Peter Campus, and hypothesized a fundamental shift in the practice of art and its material for expression. Krauss theorizes that these artists' expressions must be worked through "an object-state, separate from the artist's own being, through which his intentions must pass," like the pigment bearing substances of painting and the matter through space of sculpture: a material for expression that is the artist enmeshed in the media apparatus and a psychological state as material. She defines the crucial element of the looping electric video-circuit images of Acconci and Campus as the instantaneity of the communication from notion to message: "This is why it seems inappropriate to speak of a physical medium in relation to video. For the object (the

electronic equipment and its capabilities) has become merely an appurtenance. And instead, video's real medium is a psychological situation, the very terms of which are to withdraw attention from an external object—an Other—and invest it in the Self." The object is bracketed out, and instead the artist is creating within a psychological state invoked by the mapping of the mind onto this network; the medium becomes the nervous system.

In her analysis, self-gazing video art such as Vito Acconci's long-take videos are, for the spectator, like viewing an electronic and psychological loop between the artist, camera, and screen. Krauss differentiates the video works: installations like Campus' *Dor* which install the narcissistic circuit within the gallery, and works like Vito Acconci's *Centers* (a looping pre-recorded video in which Acconci, watching himself in his live video monitor, repeatedly points at the center of the screen, coincidentally at the viewer and the focal point of the art work) which use the narcissistic circuit as a stage for performance that is then played back in the gallery. One is documentation of an apparatus, and the other is an installation of apparatus in which the viewer is immersed. These video art works sought to reveal and emphasize the contemporary technological apparatus. The viewer's or artist's perception and the technical construction are identical. In the fashion of the Baudry diagram, we could draw the video art apparatus like I have in Fig. 13.2.

There is no need for dotted lines in the diagram to show an alternate, ideological perception because the perception of the viewer travels the same route as the wires. Both types of works cited by Krauss are loops, one presented as an object in the gallery, the other actually installed so that it can be stepped within (and frustrated in the case of Campus' *Dor*). In *Dor*, the viewer's perception should grasp equally the presence of the screen and the camera and the wire between them; that is the point. In Acconci's *Centers*, the viewer is to be aware of Acconci watching both the camera and the screen attached to it and performing within that circuit. In both works, the

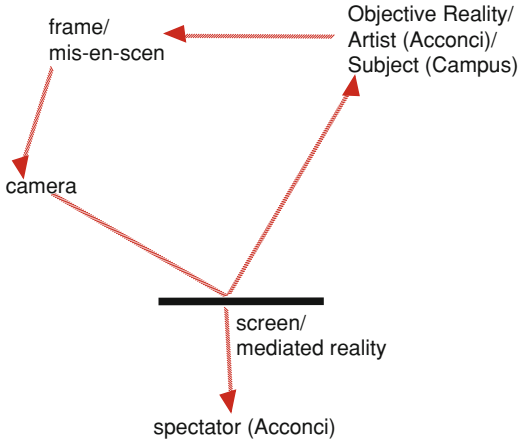

Fig. 13.2 Video art apparatus as described by Krauss

frame of the camera is the context of the conceptual statement—the framed square of the gallery art object for Acconci, the frame that separates the narcissistic projection from reality for Campus.

It is a surprisingly innocent diagram, where every trick is there to be revealed. Though augmented reality uses cameras streaming live to screens in a similar way, its construction is more complicated, and there are areas of the apparatus that are repressed in the audience's perception.

13.4 Augmented Reality

Media art, as the media philosopher Lars Qvortrup has noted, could all be described as ready-mades where instead of R. Mutt's urinal there is now a computer, a projector, a screen, a camera… (Qvortrup 2004). AR art has complicated this ready-made; it is an art of apparatus where the objects are plugged in to each other, broadcasting to each other live. It is an art of circuits.

Ronald T. Azuma in an early 1997 survey of the augmented reality medium drew the diagram I have redrawn in Fig. 13.3. The similarity to Baudry's 1970 diagram of the cinema apparatus is obvious; all that is missing is the dotted line of perception: what the spectator expects and ignores. In place of cinema's manipulation of live objects through scripting, set design, dramatic direction, here there is a direct live stream from the camera—the mediated reality that is being augmented. In place of the screen, there is the monitor or AR glasses (an invisible immersive screen that is not framed within a theater but *is* the theater enveloping the spectator). In place of cinema, montage is the "scene generator" that creates the augmentations (those virtual things not present in the live video capture). And in place of the cinema projector, there is a "combiner" that renders together the augmentation and the mediated reality of the video stream.

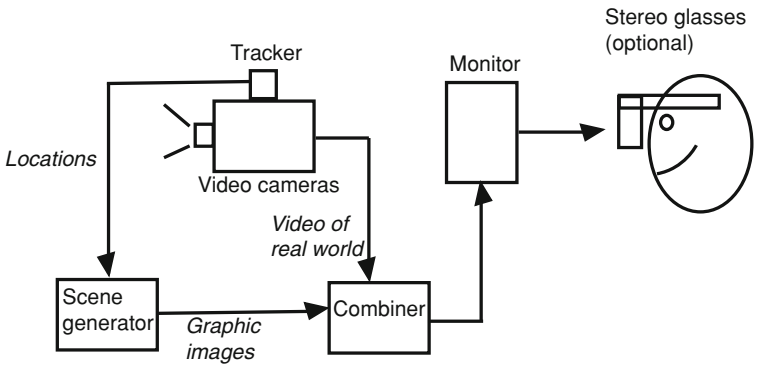

Fig. 13.3 Monitor-based AR conceptual diagram (Azuma 1997)

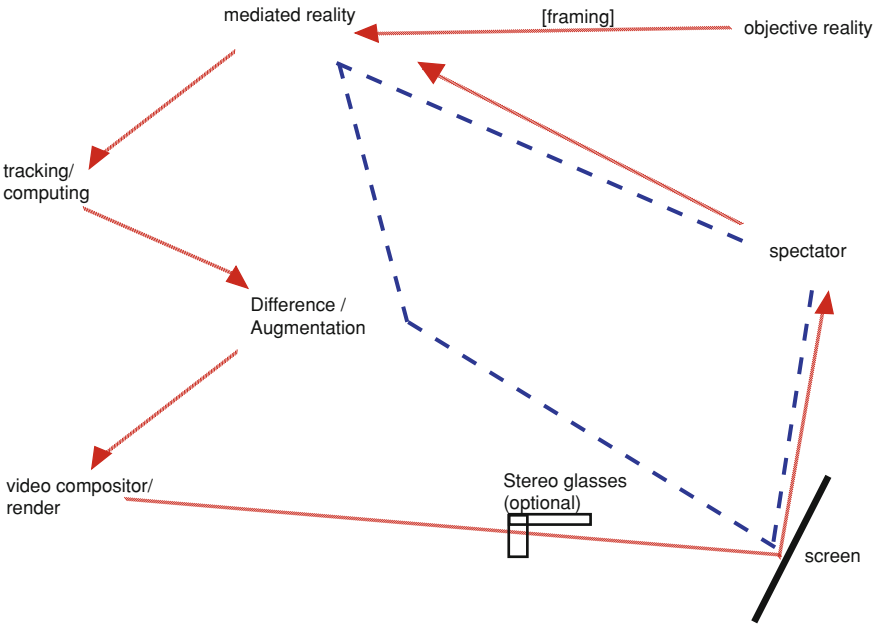

Fig. 13.4 Augmented reality apparatus (Azuma's diagram redrawn after Baudry)

After the style of Baudry, we could redraw Azuma's diagram like I have in Fig. 13.4. Here, again, the solid line draws the path of actual AR information from the objective reality captured by the live video camera, run through a tracking process, augmented with special processing and graphics, then rendered out to a screen or AR goggles (I note goggles off to the left of "screen" to denote how goggles are an "invisible screen" that envelops the viewer). If the augmented reality experience is a "magic mirror," like many AR filters and lenses, then the "objective reality" and "spectator" would coincide. "Tracking" could include face, pose, and image recognition, as well as arbitrary tracking and geo-location that place virtual objects within the environment.

The dotted line draws the normal spectator perception. Unlike Baudry's diagram of cinema, this describes the audience as aware of the screen as manipulated media. They are much farther away from the cinematic illusion of witnessing real faces and camels. The spectator is conscious of watching a "mediated reality" and not a simple reflection of objective reality. In cinema effects, digital computation and compositing are used to create a simulacrum of reality (real looking dinosaurs attack the real flesh-and-blood actors that appear on the screen), and augmented reality plays with the combination of the evidently unreal and the real. Its essence and raison d'être are that juxtaposition and border between two epistemologically diverse universes, the live mediation, and the virtual augmentation, and that border is evident. AR does not attempt to embed the viewer in an objective reality, instead the spectator identifies with a mediation—the mediation that *stands-in for* reality.

Besides the repression of objective reality, in the audience's perception, the computational processes of augmentation are also repressed. The audience is aware of the augmentation being done—such as the addition of graphics, animations, models, or other filters on the video stream— but are largely unconscious of the actual computational processing being done to the video: Any severe tracking issues such as jitter in the augmentation, or render issues such as bad aliasing would be considered a failure of the medium and would "take us out" of the experience.

13.5 Art

So, what would be an avant-garde AR art?

Industry has offered AR experiences for commercial purposes, such as Google Glass and Microsoft HoloLense, and realized popular AR experiences like Pokémon Go, selfie AR beauty apps, Snapchat Lenses, and Instagram AR Filters (Fig. 13.5). AR art is challenged to stake out territory outside these established paradigms. An avant-garde AR art will expose and utilize the structures repressed in industry production to create experiences that deconstruct our contemporary relationship to reality, virtuality, and processing.

Returning to our diagram of AR perception, we can seek out ripe areas where standard AR production is designed to repress the apparatus. The areas noted on the left of the diagram, "tracking / computing" and "video compositor/render," have been

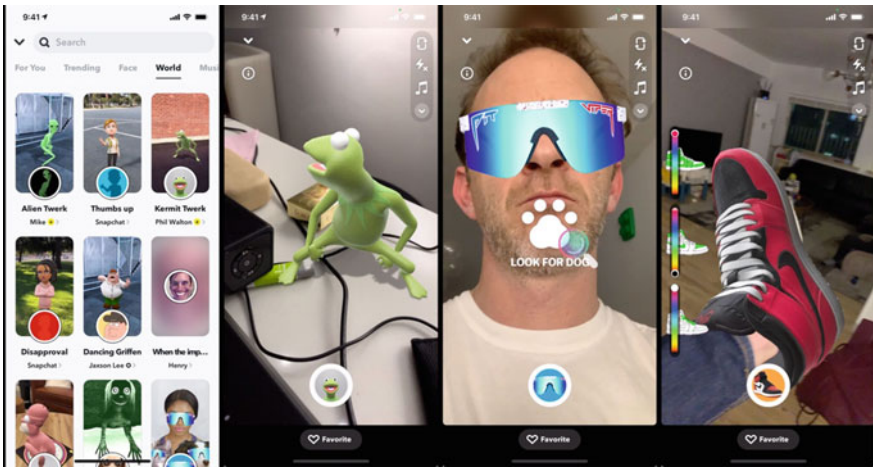

Fig. 13.5 List of popular augmented reality "lenses" within the iPhone Snapchat app (left). Three selections in action: *Kermit Twerk* by Phil Watson (center-left) which uses arbitrary tracking, *Pit Viper* by Chelsea Calvi (center-right) which uses facial recognition, and *Custom Jordans* by Objectspace (right) which uses pose/body recognition (screen captures by the author in March 2021)

Fig. 13.6 AR art using printed fiducials: 52*card Psycho* (G.A.Rhodes 2009). A custom deck of 52 cards, each printed with a unique fiducial marker, is recognized and tracked by special software; in the video feed, each card is replaced with one of the 52 shots which make up the shower scene in Alfred Hitchcock's 1960 film, *Psycho*

used in AR art for their expressive potential. Similar to "glitch art," early AR art used fiducial markers—barcode-like patterns used for image tracking and robot vision—as both a graphical key for tracking and a visible emblem of computer vision (Fig. 13.6). The fiducial pattern reveals the apparatus—a code which only the tracker and scene generator can read—and exposes the obscurity of the computational process instead of hiding it. We can ask what other internal processes of AR are manifested in objective reality. Are there other technological remainders or excesses in the state of the art that could take a similar role as fiducials?

In the diagram, the repression of "objective reality" in favor of "mediated reality" also offers an opportunity for deconstruction. Science fiction, such as *Black Mirror* (2011–2019), has sought through fictional narratives to expose the blithe repression of reality implicit in the AR experience and the implications for social justice that come with reality being subservient to a mediated AR perception. Utopian visions of AR, like the 2012 *Google Project Glass: Official Concept Walkthrough Video, "One Day*," gloss over the messy reality of living, as if objective reality will lay down and be a passive screen for augmentation. Can a genre of AR art be imagined that ruptures this brittle exterior of mediation? Contemporary life and contemporary audiences—with all our screens and media distractions—would respond to an art that reveals the intricate contradictions of desire and value, reality and virtual in which we participate.

Augmented reality, in all its permutations of live manipulated media, is the first truly network-age screen media—not just movies broadcast over electric wires, or recorded on to digital media, or enhanced through computer-calculated effects, but a medium which takes live media manipulation as its essence and material. Live mediation is the "reality" in augmented reality, and increasingly it is our own reality. This suppression of the real in AR seems fertile ground in which to explore our contemporary relationship with networked media. Today, our virtual presence and lives are made in relationship with machines that see before we see, read our digital codes and cookies and histories that we cannot know, then compile and render out their own selections of pixels and images…all without us seeing the process. Future AR art will question how to make mediation *not* seem real—and challenge our relationship to the computational machine.

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Chapter 14
Augmented Reality Painting and Sculpture: From Experimental Artworks to Art for Sale

Vladimir Geroimenko

14.1 Introduction

The terms "augmented reality painting" and "augmented reality sculpture" can refer to a diverse variety of artworks. Because the digital allows the artist to go beyond the boundaries of traditional media, many of those artworks can be more related to computer games and other types of interactive installations than to painting and sculpture in their traditional sense.

This chapter will focus on use of augmented reality that is as closely related to traditional painting and sculpture as possible. In the wide spectrum of possible AR artworks, this area seems to be especially important, because it is rooted in the history of painting and sculpture as part of a universal human culture. In this context, novel game-like paintings and sculptures seem to be the continuation of a recent computer game history rather than thousands of years of traditional art. How can augmented reality enhance and extend traditional art without turning a painting into something completely different such as, for example, an interactive movie? Can augmented reality painting and sculpture inherit one of the most distinctive features of traditional art—incredible saleability of its pieces?

At the time of writing this chapter, Google Scholar provides just a few results for a search on "augmented reality painting" and only two for "augmented reality sculpture" (Google Scholar 2017). One of the oldest research papers is entitled "Augmented Reality Painting and Collage: Evaluating Tangible Interaction in a Field Study" and describes an AR environment for painting, with a physical brush, digital textures on physical models, and creating dynamic stages for the model with spatial collages providing different backgrounds (Jacucci et al. 2005). It deals with the evaluation of a particular form of augmented reality in order to demonstrate the benefits of specific features of the environment and of its tangible interfaces. One of the latest

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https://doi.org/10.1007/978-3-030-96863-2_14

works presents a tool for creating 3D photo collages using mobile augmented reality, in which virtual pieces are textured with pictures taken with the camera and can be blended with real objects to create interesting works of art (Marzo and Ardaiz 2013).

Currently, some artists praise augmented reality painting and sculpture as the future of these art forms, but they are doing this on their websites and blogs rather than in academic papers (though with some excellent and convincing examples of their AR artworks). The blog entry "The Future of Painting?" by Jones Trevor (Trevor 2013) and the webpage and video "Between Physical and Digital: Augmented Reality Sculpture—2013" by Ian Hutchinson (Hutchinson 2013) are particularly worthy of note.

Among a variety of AR paintings and sculptures, the most common are the techniques of replacing a painting with an animated video that brings its content to life (see, for example, Baradaran 2011; Trevor 2013) and the 3D mapping projection on real-world sculptures or buildings (for some examples of projective augmented reality; see Valbuena 2007; Roberto and Teichrieb 2012). Many examples of different types of AR sculpture can be found in other chapters of this book.

14.2 Augmented Reality Painting

In this chapter, a particular type of augmented reality artworks will be considered that is close to (or is based on) a traditional understanding of painting. We will refer to this type as "augmented reality paintings" in more general terms, because augmented reality is in its very essence and also because the use of the term is consistent with the name for a similar type of books that are called "Augmented Reality Books" (see: Amazon 2017). An augmented reality painting comprises two parts: a conventional physical painting (such as an art print, or an oil or acrylic original painting) and an AR-based digital component that is integrated with the physical painting in such a way that only experiencing the both parts at the same time with an AR-enabled device makes the entire painting complete and meaningful.

To test this concept of augmented reality painting, six experimental artworks were created. They were also intended to explore and exhibit some possible diversity of this novel type of painting in terms of both its content and form. As a result, paintings 1–4 used flat images with transparent backgrounds as their augments, which were visible using the Layar application. Paintings 5 and 6 were augmented with 3D objects, floated in the air in front of them, that could be experienced with the Junaio AR browser. In both cases, a person just had to scan the physical part of a painting with their iPhone, iPad or Android phone in order to see the entire artwork.

These six augmented reality paintings constituted a solo exhibition *Hidden Realities* that took place in the Scott Building's Foyer Space (Plymouth, UK). All the paintings were gallery-quality framed A3 + art prints of original digital paintings, produced by the author. The following labels, placed on the wall near the paintings, included the title of a painting and a concise description of its main idea:

Fig. 14.1 AR view of the painting *What Lies Underneath* that reveals Black and White Photography as an historic starting point for digital photo painting (iPad screenshot by Vladimir Geroimenko)

- Painting 1: "What Lies Underneath?" An Impressionist-style digital photo painting of the Link Café at the Eden Project, Cornwall. This artwork is a tribute to the Black and White Photography that was an historic starting point for today's digital photo painting (Fig. 14.1).
- Painting 2: "The Half Kiss". A digital photo painting that brings up a question "Who is that girl kissing?" augmented reality provides the answer (Fig. 14.2).
- Painting 3: "This is not a Phone". A digital photo painting with a reference to René Magritte's "This is not a Pipe". Is the iPhone really a phone or is it something else? Look at the painting through the AR browser of your smart phone (see Figs. 14.3 and 14.4).
- Painting 4: "Augmented Quote". A digital photo painting that shows only the first part of a quotation. An augmented reality feature completes the quote, makes it funny and adds the name of the author.
- Painting 5: "Four Keywords Lost in Augmented Reality". A digital photo painting based on a constructed virtual environment. Where is the fourth key? Only your AR browser can find it.
- Painting 6: "The Hand of Moscow". A digital photo painting of Moscow's Red Square with a humorous AR parody on an infamous Cold War cliché. Beware the invisible hand! (see Figs. 14.5 and 14.6)

Fig. 14.2 *The Half Kiss* by Vladimir Geroimenko, 2013. An augmented reality painting at the *Hidden Realities* Exhibition

The above creative production has revealed that in response to the question "What would make a good augmented reality painting per se?", the closest answer would be "Integration, integration, integration!" Creative integration of physical and digital is paramount for producing "a whole picture"—augmented reality paintings are about the integration of physical and digital worlds to produce a coherent whole. Consequently, painting, constructing and putting together augmented reality artworks is a new and exciting area of creative practice.

The physical part of an augmented reality artwork can, in principle, be a painting of any kind and technique, ranging from a specially produced one to an existing masterpiece, such as a Van Gogh. It is worth mentioning, for example, a research project in which visual AR-based information (e.g. the X-ray capture and the back of the painting) has been laid over the original of such a masterpiece (Van Eck and Kolstee 2012).

Having a deep respect for oil, acrylic and other traditional painting, we nevertheless consider digital painting and particularly digital photo painting (Geroimenko 2011) as the most suitable for the implementation of painted AR artworks. Digital paintings can easily be constructed and then painted in such a way as to that allow the best possible integration between their visible parts and their hidden augmentations, because at the moment of their creation by an artist, both parts are digital. The visible part can then be materialised as a printed artwork in order to be exhibited and/or to

Fig. 14.3 *This is not a Phone* by Vladimir Geroimenko, 2013. An augmented reality painting at the *Hidden Realities* Exhibition

be sold. Usually, it would be a limited edition high-quality Giclée print that can last up to 100 years and is individually signed and numbered by the artist.

14.3 Augmented Reality Sculpture

The precise definition of augmented reality sculpture is difficult, because, on the one hand, there is a wide diversity of AR-based sculptural artworks, and, on the other hand, not every three-dimensional AR object can be considered as a sculpture.

A basic classification of the main types of augmented reality sculpture could be for the time being as follows (other types will definitely come up in the future):

- Projected AR sculptures—3D mapping of 2D digital textures on real-world sculptures, buildings and other physical objects.
- Hybrid AR sculptures that consist of two parts (physical and digital; both of them are three dimensional), which produce a sculpture as a comprehensible whole.
- (Genuine) AR sculptures that are completely digital and have no physical part.

Fig. 14.4 AR view of the painting *This is not a Phone* that reveals the hidden nature of iPhone (iPad screenshot by Vladimir Geroimenko)

Many augmented reality artworks can include digital 3D objects in a variety of sizes. Some of them can be considered as sculptures. Which ones? This depends mostly on the artist's intention and the artistic perception of the viewer.

As comprehensively shown in the other chapters of this book, augmented reality sculpture can be implemented in a wide variety of forms. These possible implementations can be represented as a spectrum. At one end are augmented reality artworks that visually are very similar to traditional sculptures, but implemented as digital 3D objects. The opposite end of the spectrum has an unlimited diversity of possible implementations that include highly interactive and animated game-like AR sculptures based on the latest relevant technologies.

In this chapter, we focus only on the "traditional" end of the spectrum, because it seems to be of a significant importance for the following reason: AR sculptures that look like traditional ones (either classic or modern) are deeply rooted in the history of art and have a more or less clear conceptual and cultural connection to their predecessors. AR sculptures of the "technological" end of the spectrum, on the other hand, can mostly be perceived by the viewer as interesting installations that are related to computer games rather than to conventional sculptures.

The following experimental work by the author can serve as an example of this kind of augmented reality sculpture.

Fig. 14.5 *The Hand of Moscow* by Vladimir Geroimenko, 2013. An augmented reality painting at the *Hidden Realities* Exhibition

The Enterprise Jigsaw was a sculptural artwork dedicated to a mission of the University of Plymouth as *the* Enterprise University. The sculpture has been exhibited in the City Jigsaw Garden in Plymouth, UK, since 24 March 2011. The augmented reality installation consists of a three-dimensional digital sculpture "erected" nearby the main campus, in front of the university's flagship building and right in the middle of the Jigsaw Garden (see Fig. 14.7).

Viewing of the artwork requires the Layar Reality Browser to be installed. The viewer can easily perceive that the augmented reality sculpture is *really* placed in the real-world environment—in the middle of the Garden. To be convinced of this, they should follow the pavement around the Garden looking at the sculpture from all possible viewpoints.

As such, the digital sculpture *The Enterprise Jigsaw* is a 3D augmented reality object, consisting of 11 jigsaw puzzle pieces that form a word that uses jigsaw-style fonts and reads *Enterprise* (see Fig. 14.8).

This augmented reality installation bears several symbolic meanings. It represents the developing enterprise relationships not only between the University and the City of Plymouth, but also between the real and digital worlds. The University of Plymouth (renamed to Plymouth University), *the* Enterprise University, is the key piece in the regional "Enterprise Jigsaw" with its "commitment to driving social inclusion, economic prosperity and environmental quality in our local community and beyond".

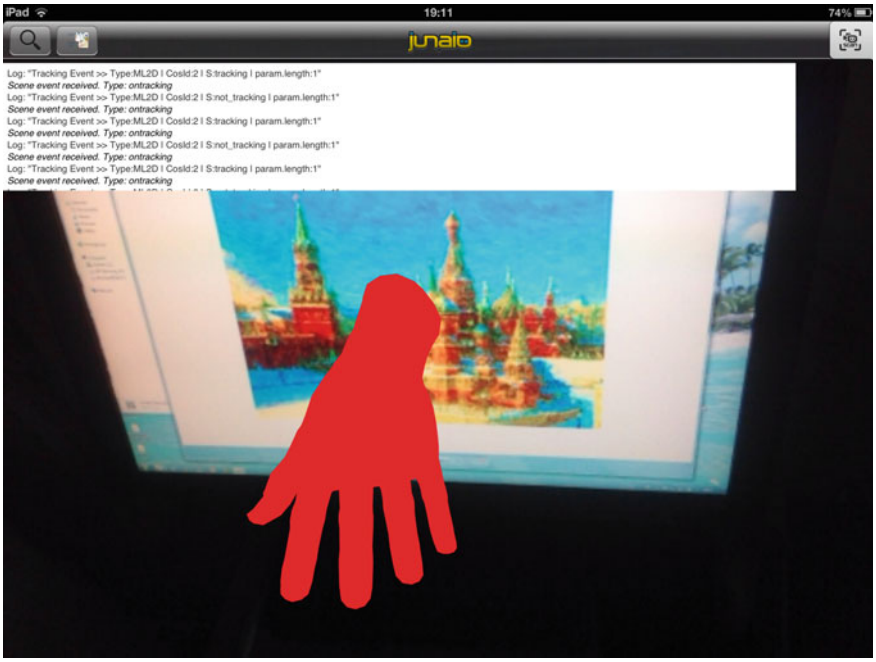

Fig. 14.6 AR view of the painting that shows a hidden red hand of Moscow (iPad screenshot by Vladimir Geroimenko)

This sculptural artwork combines the artist's personal attitude towards enterprise with the strategic mission of Plymouth University. The enterprise is a puzzle, an adventure. Putting the jigsaw pieces of an enterprise project together is both challenging and fun.

14.4 The Saleability of Augmented Reality Artworks

One of the main problems that augmented reality art is facing on its way to become a "legitimate" form of art is to make AR artworks saleable. This, for example, was clearly stated by Lanfranco Aceti in his Editorial to the LEA double issue on augmented reality art: "Problems though remain for the continued success of augmented reality interventions. Future challenges are in the materialization of the artworks for sale, to name an important one. Unfortunately, unless the relationship between collectors and the 'object' collected changes in favor of immaterial objects, the problem to overcome for artists that use augmented reality intervention is how and in what modalities to link the AR installations with the process of production of an object to be sold" (Aceti 2013).

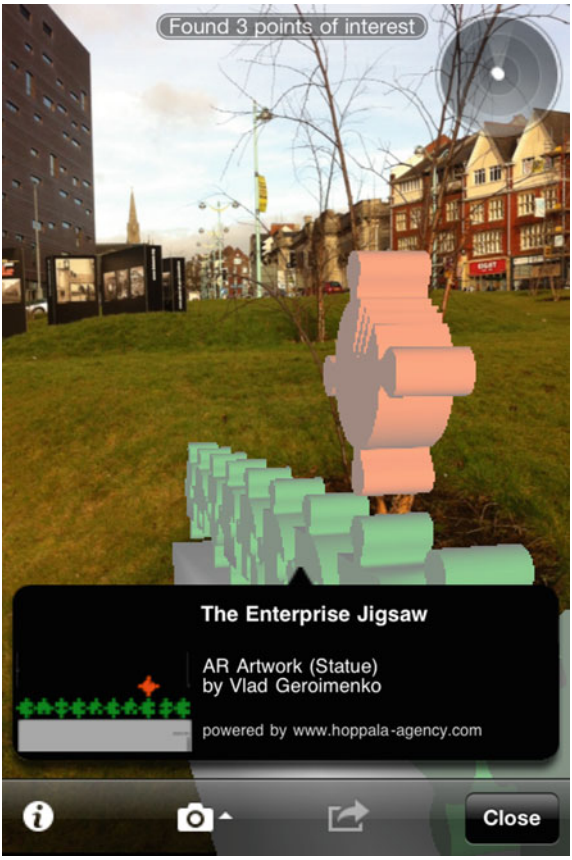

Fig. 14.7 *The Enterprise Jigsaw* by Vladimir Geroimenko, 2011. An augmented reality sculpture. An AR view in the real-world environment of the Jigsaw Garden (iPhone screenshot by Vladimir Geroimenko)

Although the problem is common for augmented reality art in general (because of non-material nature of its augmenting objects), there are different types of AR artwork (Geroimenko 2012, 2013a) that may have a dissimilar commercial potential. Augmented reality painting and augmented reality sculpture can serve as good examples of this: a particular type of augmented reality paintings described earlier in this chapter seems to be (at least, for the time being) the best candidates for "AR Art for sale" (Geroimenko 2013b), while the saleability of augmented reality sculptures is rather uncertain and questionable at the moment.

In general, the sale of augmented reality paintings can encounter particular difficulties, some of which are rather obvious and can be named a priori:

- The key technical issue is the availability of the AR component of the painting: the server can be unavailable for a while or shut down for good, a new version of the AR browser may have a compatibility issue with older content and so on. However, an AR painter or seller has somehow to be able to provide (despite all

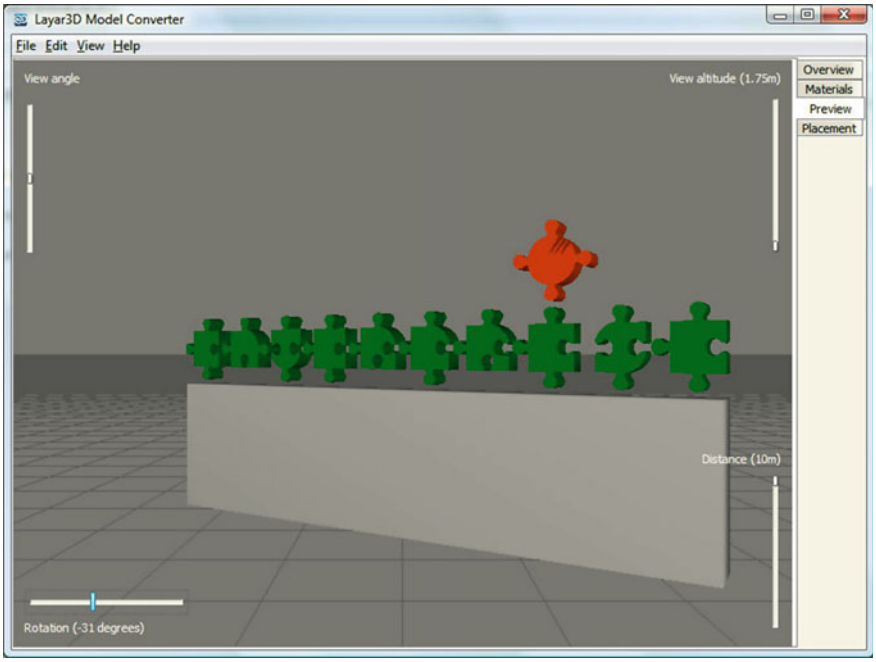

Fig. 14.8 *The Enterprise Jigsaw* by Vladimir Geroimenko, 2011. An augmented reality sculpture. A design view in the Layar3D Model Converter (MacBook screenshot by Vladimir Geroimenko)

possible and unpredictable technical glitches) a warranty that an AR painting will be "functional" for a certain period of time.

- The main creative problem can be the artistic merit of the physical component of an AR painting, as was discussed above. In other words, a limited edition print, hanging on a wall, should be "cool" in its own right. The AR component is intended to enhance it aesthetically, conceptually and, of course, visually. Furthermore, it presents "the hidden meaning of a painting" in a completely new way, namely by "materialising" its concealed AR parts (i.e. by showing a hidden meaning *in a literal sense*).
- As of today, the major problem could however be the novelty of augmented reality paintings. It will obviously take some time before the current level of knowledge about this new form of art develops significantly to affect art buyers' behaviour. The current situation seems to be a paradoxical catch-22: to become a popular form of art, augmented reality painting should be in the art market; to become a highly saleable art form, the acceptance and understanding of augmented reality painting should be widespread in advance.

In spite of these real and potential difficulties, the particular type of augmented reality painting, that combines digital painting and AR technology with gallery-quality limited edition prints, can provide rather realistic opportunities for breaking

into the art market. Rephrasing Frank Lloyd Wright's humorous citation "If it sells, it's art" (Wright 2013), one can say about the emerging augmented reality art in general: "As soon as it is on sale, it will become much closer to universal recognition as a new form of art". Augmented reality paintings should and hopefully will find their way to private collections around the world.

The proof of the concept of saleability for this specific type of augmented reality paintings has been a success—some paintings from the *Hidden Realities* Exhibition are now available on Amazon (Amazon 2014). In fact, the painting *The Half Kiss* has probably become the first-ever augmented reality painting for sale, and it was certainly the first-ever AR painting for sale available on Amazon (see Fig. 14.9). At the time of writing of these lines, none of its copies have been sold, so how can we be sure a priori that some of them will sooner or later have been sold? All the previous experience of the author of this chapter indicates a strong possibility. He started selling his limited edition art prints in 2009 via the Online VG Art Gallery (Geroimenko 2009), Amazon and eBay. To date, many signed gallery-quality prints of his digital paintings have been sold to private collections in several countries (UK, USA, Canada, Australia, Germany, France, Spain, Switzerland, Holland, Finland, Malta, Brazil, Mexico, Russia and Belarus).

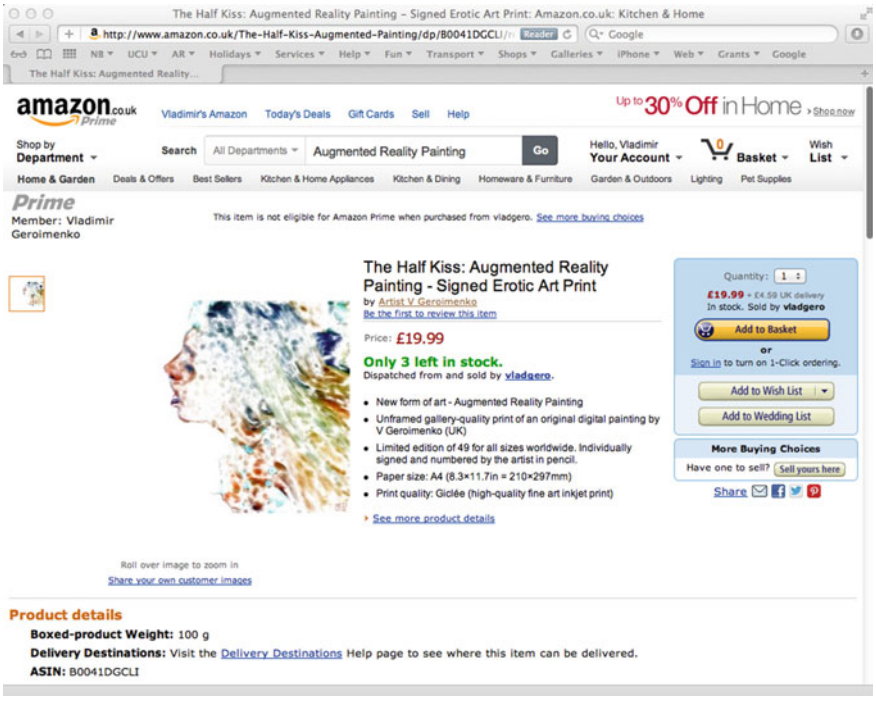

Fig. 14.9 *The Half Kiss* by Vladimir Geroimenko, 2011. The first-ever augmented reality painting for sale on Amazon (Amazon 2014)

Therefore, it is quite possible to conclude that this type of augmented reality painting is in principle saleable, because the physical part of an augmented reality painting is essentially identical to a regular art print sold by the author earlier. This also means that in a good augmented painting, the physical part (e.g. art print) should have a significant artistic value on its own, since it is supposed to be exposed on a wall all the time. Its augmented reality component may complete the painting in several ways (e.g. visually, conceptually or aesthetically), but only from time to time (when someone is viewing the painting through an AR-enabled device).

The saleability of augmented reality sculptures is much less certain and presumably depends on the type and also the size of a sculptural artwork. Small augmented reality artworks (figurines, busts, carvings and the like) that are based on the use of augmented reality markers and image recognition technology can in principle be put for sale in the same way as the augmented reality paintings described above. In such a case, an augmented reality sculptural artwork has to consist of the following two parts: a small-size augmented reality sculpture (the main part) and a marker (the auxiliary part). The latter can be a purely technical (but aesthetically good) pattern to trigger and to correctly place the 3D digital sculpture or it can be a printed or painted artwork that is meaningfully connected and artistically integrated with the main piece of art, namely the augmented reality sculpture per se. Figure 14.10 shows an experimental work of this type produced by the author: an abstract augmented reality statuette (a simple 3D shape) placed on top of a conceptually unrelated (meaningless) augmented reality marker—a black and white print of a surrealist painting by the author.

Our working hypothesis is that this type of sculpture could be saleable in a similar way as the described augmented reality paintings. The buyer would have purchased an augmented marker (that itself could constitute an artwork) and placed it on the floor, on a table, on a wall and the like. After this, the art collector can enjoy the "hidden" AR sculptural artwork by making it visible in an augmented reality browser and by moving himself or herself around it in order to see the 3D creative work from any possible angle.

An "opposite" large-scale type of augmented reality sculpture may include gigantic artworks that are placed into a physical location using GPS technology rather than visual markers. Such artworks are suitable for city squares, historic landscapes and similar vast environments. It seems unlikely (at least, at the moment) that such augmented reality sculpture can be sold via Amazon or eBay. However, an artist could be commissioned to produce a sizeable augmented reality sculpture by, for example, a City or Art Council.

14.5 Conclusions

Augmented reality painting and augmented reality sculpture are newly emerging forms of art that may encompass a variety of particular types of artworks. Some of them can be highly technological and interactive and to this extent bear resemblance

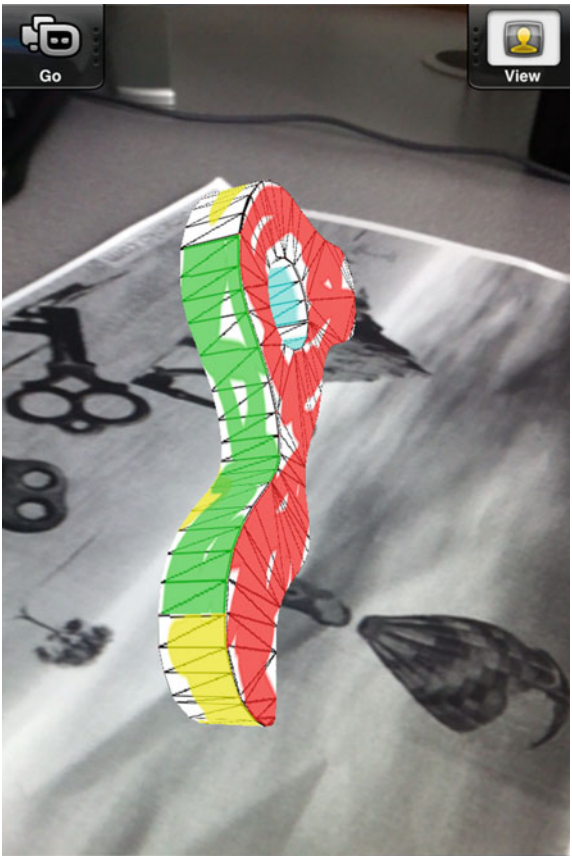

Fig. 14.10 *Untitled* by Vladimir Geroimenko, 2011. Augmented reality statuette (experimental work)

to computer games. At the same time, some of them can intentionally not rely on interactive multimedia technologies and be closer to traditional forms of paintings and sculptural works. In this case, conventional paintings and art prints can easily be extended, enhanced or embellished with hidden AR objects that are able to convey a deeper meaning of the artwork. This type of augmented reality painting possesses all necessary features to become popular and saleable art in a similar way as its traditional predecessors. Augmented reality sculpture has a more modest sale potential, but in many cases can be commissioned to be "erected" in public places instead of expensive physical sculptures.

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Chapter 15
Augmented Reality Graffiti and Street Art

Ian Gwilt and Jack Wilde

15.1 Introduction

Graffiti has always augmented real-world locations and environments, providing social commentary, unsolicited opinion, proof of occupation or simply by dint of adding color and visual content to our utilitarian city infrastructures. Either through the opportunistic act of an addition to an urban surface or by invitation to create a site-specific response to an existing form or predefined public space, 'traditional' graffiti and street art have always had a relationship with the architecture, street furniture, surfaces and materials that define and delineate our urban experience. Invited contribution or not, it could be argued that these interventions help turn Marc Augé's notion of urban non-places into inhabited environments, wherein today's 'supermodern' spaces are drawn back into a lived and lived in, imperfect experience (Augé 2008). These broadcast images and symbols also transition the public to the personal—an assertion of individuality for both the creator and the viewer—prompting us to question what is our role, interest in and connection to the community and place in which we live.

This chapter looks at how the concept of Augmented Reality graffiti (AR graffiti) enables us to experience an augmented view of the urban environment. By running Augmented Reality (AR) software on mobile devices such as smartphones and handheld computers, virtual content including images, audio, video, animation and typographical messages can be placed into a digitally enhanced view of a city

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scene. This facility allows us to switch not only between a personal and shared experience of an artwork or urban space but also to experience both digital and analog versions of the same environment. In this chapter, we will examine how the intersection between graffiti, street art and AR provides us with a complex socially and technologically encoded interface that has the potential to combine the first-hand experience of public space, digital media and creative practice in a hybrid composition. We begin by looking at the tradition of graffiti and street art, followed by an investigation into the philosophical implications for the digital augmentation of this type of work. A number of key techniques and technologies for AR graffiti are explored and discussed through case studies.

15.2 Definition and History of Graffiti

The idea of graffiti in its conventional sense conjures up images of painted words or drawings, sprayed on a wall, possibly offensive, prohibited certainly, whereas the notion of 'street art' suggests a more urbane, legitimized activity with perhaps a greater level of artistic merit and community buy-in; we are increasingly seeing more examples of assigned wall spaces and public commissions for street art. For the purposes of this chapter, we use the terms graffiti and street art as a shorthand to describe the range of (non-corporate) visual languages we typically encounter in the urban landscape. This chapter does not attempt to justify or establish a position on a set of activities, which are seen to be by degree sanctioned and unsanctioned, legal and illegal. Indeed, the legitimacy and cultural acceptance of graffiti and street art vary quite dramatically from place to place and are still very much under debate (Macdonald 2001; Rowe and Hutton 2012), while the works of some well-known artists fetch high prices in the art world, other works are regarded as illegal acts. What we are interested in here is the way that graffiti and street art form part of a shared urban visual language and how this language can be adapted and developed in an increasingly technologized society.

It is useful, however, to briefly consider how the visual language of graffiti and street art has developed, as a precursor to thinking about how creative practitioners utilizing the potentials of AR technologies might begin to work with these conventions. Anna Wacławek traces the rise of contemporary graffiti back to the signatures, letters and words created by artists on the east coast of America in the 1960s (Wacławek 2011). By the mid-1970s, these 'tags' which tended to be quickly created, single color forms had also developed into more elaborate typographical designs called 'throw-ups' or 'throwies'. These in turn led to the further development of larger more complex 'pieces' or murals, often incorporating figurative elements and involved compositions (Wacławek 2011). These highly illustrative works are more closely associated with the idea of 'street art', visually elaborate combinations of color, shading, typography, graphic symbols, abstract patterns, cartoon elements and realistically drawn images, used in the formation of carefully constructed designs. As the visual languages of graffiti and street art have continued to expand, so have the

materials and techniques used to create the works. The traditional use of spray cans and broad-tipped markers has been extended with among other things the introduction of paper and cardboard stencils, which are used as templates to quickly recreate a predesigned image by spraying through the holes on the stencil. From the artist's perspective, this technique has an additional advantage in that it enables the easy creation of multiple versions of the same image. A variety of 2- and 3-dimensional materials, which can be stuck on or applied to surfaces, are now also being used to create work.[1] This includes the popular practice of pasting up pre-printed, sprayed or drawn paper-based posters, which again have the advantage of being quickly repeatable so that large areas can be covered in a tile-like effect should this be desired. A number of other types of painting techniques are used in the creation of the more elaborate pieces, with bespoke processes such as the use of cleaning cloths, water and solvents to create monochromatic images on grimy urban surfaces being developed.[2] Lastly, there are a number of new technology graffiti pieces that are created through the use and control of lights, laser beams, data projectors, Spatial Augmented Reality (SAR) and other digitally facilitated interventions. AR graffiti continues this tradition of expanding the visual language of graffiti and street art by incorporating new techniques and technologies. Completing this cycle of technologically mediated graffiti, it is even possible to graffiti the digitally generated walls in Virtual Reality.

15.3 Philosophical Issues for Graffiti, Street Art and AR Graffiti

Aside from the issue of legality, there are a number of other issues worth considering in relation to the idea of AR-enabled graffiti. As Wacławek points out, one of the defining qualities of graffiti is that it both assimilates the city environment, as well as recreating it (Wacławek 2011, p. 9). There is a natural vernacular inherent in graffiti and street art, which is played out between its physical location and the social cultural expectations of that environment and through a dialog and interplay with the other visual languages of the street, including formal signage, advertising posters and even other pieces of graffiti (Poynor 2001). Through this urban bricolage, created by the juxtaposition of images and surfaces, it is often difficult to establish a visual hierarchy of meaning, importance or legitimacy (Crow 2010). Adding further content to our experience of the urban environment through the use of AR technologies needs then to be considered in the context of this multifaceted ecology of image making and meaning. For example, will located access to extra digital content help to define and explain the existing physical environment or add to its complexity?

[1] See the work of Invader (http://www.space-invaders.com/) and the use of mosaic tiles to create images of space invaders on buildings. In some cases, a map of the sites enable's people to follow the images around a particular city.

[2] See the work of Paul 'moose' Curtis who is credited with the idea of reverse graffiti (https://en.wikipedia.org/wiki/Moose_(graffiti_artist)).

The potential to add virtual layers of content and information to urban spaces speaks to Mitchell's polemic about digitally enhanced cityscapes. In his book 'City of Bits', Mitchell espouses the potential for digital technologies and technological platforms to hybridize both human experience and architecture, in a way that will help us process and navigate our urban surroundings (Mitchell 1995). Understanding and controlling the socio-cultural, political and economic agendas attached to the addition of virtual content to our experience of the city should be high on the agenda of any emerging AR street artist. Iain Sinclair's politicized interpretation of the contemporary psychogeographical experience suggests that the detached wanderings of the flaneur are a thing of the past, and that like our other encounters of the city today, any AR facilitated experience of the urban will be loaded with expectation and purpose (Coverley 2010; Sinclair 2003).

As well as changing our experience of the urban space, graffiti and street art also challenge notions of the ownership of these spaces, especially if the acts of the artist are seen as unsanctioned and interventionist (Wacławek 2011, p. 9). However, it is interesting to consider whether the qualities found in the virtual nature of AR graffiti go some way to disarming the contentious act inherent in physical graffiti. In a number of ways, the mediation of AR technologies produces a benign form of graffiti, since no physical content is added to the environment, and the work can only be seen while the viewer interacts with the space through the AR device. Moreover, the process of creating AR graffiti (through the use of the computer) is quite a different act compared to the visceral nature of creating physical graffiti, which is associated with the smell and sounds of spray paint, the feel and effect of different wall surfaces and the influences of weather, lighting conditions, environmental pollution and other hazards. That said, AR graffiti inherently retains a close relationship with the physical environment, and the makers of AR graffiti still need to work closely with physical spaces, sourcing locations, working with a specific site and building an awareness of the environmental and social influences that impact on the space. Creators of an AR experience may also work with traditional street artists, and the hacktivist/open-source mindset of many of the AR makers is sympathetic to the counter-culture positions taken up by many graffiti artists.

However, there is some debate about how and if graffiti is changed when it is sanctioned by the art world, and certainly, there can be an increased dollar value, but is this gained through the loss of adrenalin engendered fear of discovery (Ellsworth-Jones 2013; Macdonald 2001). Like the commodified graffiti of the art world, AR graffiti attracts a kind of cultural legitimacy, created by the need for digital technology to enable the experience and notions of the digital divide that might privilege who can have this experience. Although AR graffiti might not yet be as ubiquitous in terms of accessibility to physical street art, the dramatic rise in the use of smartphones, mobile technologies, tablet computers, etc. means that the possibility for making and viewing this type of work is rapidly expanding as these enabling technologies become increasingly available and commonplace.

In addition to the general allure of online content and desire to photograph the endless minutiae of everyday interactions, for many people, the current proliferation of QR codes contributes to a heavily mediated experience of the world through

the screens and cameras of their handheld devices. Constant attention toward these devices suggests a high potential for incidental scanning of any AR stimuli that may exist within close proximity, thus increasing the likelihood of encounters with virtual content.

The potential for AR stimuli to appear and even surprise us, through targeted symbols or shapes beyond the comparatively standardized QR code is heightened when access to handheld devices is increased or ongoing, including the playing of 'pervasive games' such as Pokémon GO. Daniel Della-Bosca (2019, p. 260) indicates the potential of surprise encounters with art through use of AR in public spaces:

> 'We happily give ourselves over to new realities as we become something else through play. What Augmented Reality is offering the disciplines of Art and Design through Public Art is something quite wonderful. Every aerosol spatter, purpose made fiducial marker, architectural feature, graphic sign and much more has the potential to be meaningful new symbols in the language of games played in public spaces'.

The performance involved in accessing these markers, whether sought after or discovered through chance (or the Debordian dérive[3]), is suggestive of an encounter with physically located graffiti and street art—not only as a surprising or often jarring exposure through revelations in the unfolding masses of urban environments, but also to the notion of fluidity of experience and the palimpsest of street environments wherein the nature of graffiti and urban surfaces can (potentially) alter from day to day.

Interestingly, as AR street art becomes more popular, it remains to be seen if the existing tension between a desire for anonymity and self-expression/recognition, which is played out between conventional graffiti artists, who communicate with each other through a common visual language and an unwritten code of practice, will be paralleled within AR-enabled graffiti (Macdonald 2001). Commonly with AR, and particularly when it is used as an art form, there is no explicit instruction as to what the viewer will encounter when they follow a QR marker or launch an AR application to look at a piece of work. The viewer can be exposed to undisclosed content that is only revealed once the decision to view and the technological connection have been made. The relationship between the viewer and the creator of the work must be built on trust, experience and an understanding of the media form. Therefore, successful communication is contingent on establishing a context of use and the setting up of expectations that relate to what is anticipated and how a viewer might respond/behave when the AR content is revealed. Creators of located AR need to be mindful of both the viewer's expectations and the content of use.

In the following section, we will look at different techniques for the generation of AR graffiti and its potential in terms of storytelling through the creative use of media.

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[3] 'In a dérive one or more persons during a certain period drop their relations, their work and leisure activities, and all their other usual motives for movement and action, and let themselves be drawn by the attractions of the terrain and the encounters they find there. Chance is a less important factor in this activity than one might think: from a dérive point of view cities have psychogeographical contours, with constant currents, fixed points and vortexes that strongly discourage entry into or exit from certain zones.' Debord (1956).

15.4 Augmenting What and Where: Markers and Clues, Techniques and Technologies

Early examples of AR used fiducial markers for the tracking and positioning of the viewer or the viewing device. This allowed virtual content to be displayed in relation to the point of view and position in physical space and for the combining of AR content on a digital screen (Bimber and Raskar 2005). With the development of more sophisticated image processing software and the utilization of combined Wi-Fi, cellular and GPS tracking and 'Simultaneous Localization and Mapping' technologies (SLAM), many AR applications that now run on mobile devices can directly recognize the visual patterns incorporated within the shapes and images of graffiti and street art. These technologies remove the need for visual QR markers to be placed in the physical environment. However, although abstract and nonsensical in human terms, the small black and white squares or geometric shapes of these QR markers do operate as a useful device, in that they provided a visual clue for people to recognize that AR content is available. The use of QR markers as a COVID-19 track and trace device has firmly established the QR code as a means of accessing digital content. With the new types of 'transparent' AR markers—where almost everything you look at can effectively be tagged with virtual content—the question is, how do we know when and where to look for this content? In the urban environment, the existing visual language of graffiti and street art can directly operate as a useful device for indicating that virtual AR content might also be available in a specific place.

Assuming we know where and how to find it, with AR graffiti, it is possible to make use of all the conventions of contemporary digital media. Drawn and photographic visual media, computer-generated 3D models, typographic and information graphics, video, animation and audio content can all be used in the creation of AR artworks. AR graffiti can use the potential of digital image making and effects to extend, create and reveal new and additional stories around conventionally made graffiti and street art. However, as observed in the uptake of digital visual effects in mainstream media, the mapping of digital content into realistic scenes needs to be carefully considered, managed and applied in such a way that it adds to the experience of the viewer and does not detract (McClean 2007).

A number of early exponents of AR graffiti experimented with ways of recreating the visual languages and techniques of traditional graffiti using the capacities of the digital. One very popular idea was to create spray-painting applications that allowed people to virtually tag and bomb buildings. This reimaging of the graffiti visual language has also more recently included the creation of 3D versions of throw-ups, which can be navigated in virtual space, literally adding another dimension to the work. These experiments demonstrate that the scope for creating AR graffiti is by no means limited to a small number of artists and the displaying of pre-authored content. The phenomenon of social media and the potential to contribute, alter and comment on pieces of work are another aspects of AR graffiti that are being explored. Mobile apps are now available that facilitate user-generated content, which can be created

and shared in line with social media conventions. Moreover, AR graffiti can also be generated remotely and realized at a specific location.

It remains to be seen if and how the self-imposed codes of practice which govern the creation and 'overwriting' of physical graffiti and street art will transfer and be adapted to these virtual creations. However, one advantage of these technologically facilitated artworks is that they are virtual, temporary and do not damage or permanently hide the underlying surface or material.

As discussed, there are a number of different ways to create a piece of AR graffiti or street art. The techniques for relating AR work to the physical urban environment (and how we encounter it) can be divided into two main categories: (1) by the generation of AR content that adds to and responds to existing pieces of physical graffiti or street art and (2) by the generation of AR work that adds content to or responds directly to physical urban infrastructure or a public space. In the first category, existing graffiti typologies such as tags, throw-ups, stencils, stickers, murals and other interventions are added to through the use of AR technologies, which are viewed through a digital device such as a mobile phone or handheld computer. In the second category, the physical infrastructure or public space is directly augmented with virtual content layered over, for example, the surface of a building, pavement, piece of street furniture or existing signage. Alternately, AR content might be located and realized in 'empty' public spaces such as parks, alleyways or underpasses where it can be discovered and revealed with the aid of a digital device and the recognition of a particular location.

In the following section, we introduce two case studies, one that places AR content relative to existing public artworks as outlined in the first category and that responds directly to everyday street furniture and urban structures as defined in the second category.

15.5 Case Studies

15.5.1 Case Study One: BC Biermann and the Heavy Projects

In the work of BC Biermann and 'The Heavy Projects' initiative, highly illustrative paintings (produced by mural artists) are combined with virtual content to augment the original images (Biermann 2013). In these works, mobile devices running the Re + Public AR app allow the public to view virtual additions by pointing a mobile device toward a real-world mural and looking through the digital screen (Fig. 15.1).[4] By doing this, AR content is mapped onto the screen image of the mural. The digitally generated content is used in two ways: first, to change the image content within the 2D picture plane of the mural by creating pictorial and animated sequences

[4] A number of murals were augmented as part of a collaboration called "Re + Public" (http://www.republiclab.com) which took place with Jordan Seiler, a NYC based artist who also runs Public Ad Campaign.

Fig. 15.1 The Heavy Projects, How & Nosm mural augment (2012) Full view [L], Screenshot [R] (Images reproduced courtesy of the artist)

that 'overprint' and narrate parts of the original image. Second, by adding substantive additional virtual content that appears to spill out into the urban environment, dramatically extending the work above and in front of the original image. In different examples, illustrations of people, plants, letterforms and geometric shapes create a temporal narrative around the original murals, as they are animated and move out into 3-dimensional space. In some instances, virtual content sits on sequential layers like the images in a pop-up book, and in others, it hovers in space, in imitation of solid 3-dimensional objects. In one work, the addition of luminescent waterfalls allows the mural to be seen in the dark; in another, oversize geometric shapes and patterns shimmer and move in front of the mural, reforming in different combinations for different viewers and different occasions. People and cars appear to move in out of the virtual layers as they go by, and the combined content as seen in the screen of the mobile device can be viewed as you would a painting in a gallery, allowing you to walk close to the work to examine a particular detail or step back to see the whole piece. However, unlike painting or a conventional piece of street art, the viewer can move through the layers, giving the impression of being inside the artwork. With these AR works, the artists are very much concerned with rethinking the use, perception and boundaries of public space, and they adopt mobile AR technologies to allow people to experience the urban landscape and their relationship with it in a different way.

15.5.2 Case Study Two: Shannon Novak

Shannon Novak describes himself as a synesthete, someone who can see colors and sounds in everyday objects. In many ways, AR is the perfect medium for a digitally informed artist who can pick up on the resonances and cross-references between digital media forms. Novak's AR work builds a relation between compositions of staccato notes and geometric forms to not only create a discourse between audio and image, but also between digitally generated content and the physical environments that they are mapped onto (Novak 2013).

Fig. 15.2 Two works by Shannon Novak, Transcription -36.848264,174.762129 (2013) [L], Manhattan Phrase Site 4: 40.737755, -73.997383 (2013) [R] (Images reproduced courtesy of the artist)

Novak describes his work as compositions for objects and spaces, and he uses the sides of buildings, public parks and street signage as canvases for his work (Fig. 15.2). However, these real-world artifacts and spaces are more than simply placeholders for virtual content, as the digital audio/visual animations that make up Novak's work are created specifically for each location. Each site is considered from a number of perspectives, which include the physical geometry, the surrounding environment and other socio-cultural and operational connotations that might be associated with the place. These factors are then used to inform animations consisting of formal compositions of abstract geometric symbols, color and music, which unfold over the virtual surface of the physical location or artifact.

Interestingly, Novak makes the point that unlike conventional graffiti, which can be physically removed or painted over, the evanescent nature of AR graffiti means that it is in some ways harder to regulate. Moreover, the virtual nature of AR means that it is relatively easy for the artist to change, adapt or update the work. Novak's observation that AR graffiti can also hide physical spaces or activities is an interesting proposition in relation to how graffiti and street art can shift the communal perception of a public space. In the work 'Manhattan Phrase', Novak creates personal AR responses to the musical history of 12 different sites on 14th Avenue, New York. Laden with cultural histories, these sites are reimaged and reimagined through Novak's AR interventions that blur the empiric moment with augmented sound and image and work as a sort of shorthand to the patina of personal and social memories and experiences that can build up over time in the same location.

In considering these two case studies, it should be remembered that the conventions and rules for this new media form (and, how it might be experienced in the public domain) are as yet, not fully developed or broadly understood by the general public or indeed defined by the creators of the works. Informing people where AR content might reside in the urban environment and how it should be accessed and or responded too is still a work in progress. Novak is aware that audiences react

differently to his AR creations as they experience them in situ; from the response of the techno-evangelist who is happy to embrace the concept of AR graffiti and willing to initiate others into the experience, through to confused but interested first time users, who find different ways of engaging with the work. This interest in how AR within a public space might begin to accommodate a broad level of social inclusion and meet the needs and the desires of the community is something that also resonates with the designers of the Re + Public app.

15.5.3 More Recent Examples

As technological access improves and the public understanding of this type of work increases, more examples of work from practitioners in the field have begun to emerge and define the potential of AR graffiti and its contribution to a shared urban visual language and culture. Recent demonstrations at the intersection of AR technologies and street art/graffiti can, ironically, be observed in the gallery work of Spanish artist Escif, a muralist from Valencia whose past work had been known to communicate social messages by, for example, '[warning] of the trials of modern life, from police violence to gentrification and consumerism' (Palumbo 2018). Entre l'amour et la peur, Escif's 2018 contribution to Palais de Tokyo's 'Encore un jour banane pour le poisson-rêve' exhibition, translated the theme of childhood 'wonder, inventiveness and anxiety' (Palumbo 2018) into a series of abstract marks (markers) drawn by a group of children that, when scanned through the custom AR app Graffiti Yoga, displayed the artworks that had initially stimulated the marks (Fig. 15.3).

Concurrent to this installation was Escif's AR piece entitled 'Tokemon Go' (2018) which, through the app, augmented existing works within the Palais, including 'shopping bags on a Kiki Smith sculpture; the cast of the Power Rangers posing under the words 'Sorry for Fukushima' on a staircase; and a pastry, titled Security Brioche—a pun for 'security breach'—hovering above Tomoaki Suzuki's hyperrealistic miniatures of two men' (Palumbo 2018). Although far removed from the site of most graffiti and street art and lacking perhaps the essential aura of real-world examples, Escif's work is nonetheless indicative of the inherent potential in AR to commit the act of graffiti as transgressive public interjection.

Escif's work in this regard demonstrates that the inclusion AR's nominally subversive potential is not limited to street encounters: The MoMAR project interacts specifically with works located in the MoMA gallery in New York to generate 'contested' spaces wherein AR overlays and interacts with existing works without prior permission. By doing so, MoMAR aims to emphasize both physical and virtual spaces as democratic and unsanctioned:

> 'In this case, it is the viewer who retains authority over what is seen in a particular location (through choosing to use the MoMAR application), hinting at a potential future where all visual space could be personalised, returned to the individual through augmentation technology. In these ways, contemporary image technology, both in the form of image production and image viewing devices, as well as the broader sociotechnical and extended lives of the

Fig. 15.3 Escif, *ENTRE L'AMOUR ET LA PEUR* at Palais de Tokyo, Paris, 2018. Courtesy of the artist. Source: https://www.artsy.net/article/artsy-editorial-street-artist-escif-augmented-reality-challenge-boundaries-graffiti

image, can therefore restructure our political experiences of public space and our situated political lives' (Buchanan 2021, p. 9).

15.6 Conclusions

Generally speaking, all graffiti is a form of addition (welcome or not) to the visual language of the public realm. Similarly, the concept of AR graffiti allows us to reimagine and contribute virtual content to public infrastructures and shared spaces. Like traditional graffiti, there is always a connection between where we encounter the AR work and the physical environment. This relationship is made simply by the fact that AR graffiti has a 'fixed' geo-location or a specific viewing point that the viewer needs to occupy to activate the work. The 'located' nature of the AR graffiti, both in terms of place and context, means that it is possible to create a dialog between a physical location and the content and design of an AR work.

Within this chapter, we have looked at how the concept of AR graffiti has the potential to build on the visual languages of art and graffiti and the urban infrastructures of a modern-day city environment, as part of the ongoing fusion between analog and digital contents. AR street art and graffiti contribute to the confluence of when, where and how we experience these two paradigms in tandem. The dialogic potential of AR graffiti marries urban social narratives and personal experiences with the dynamic potential of the digital and the tacit authority of material form. Where AR art foregoes the level of tactile, assemblage-like massing of much graffiti, its

digital layering is temporal in different ways to those of paint and paper as it adds an immediacy and impermanency to existing spaces that is perhaps more in keeping with the nature of experience itself. In this way, it invites us to re-evaluate the objects and structures it interacts with in ways that are more instant than reflective.

The difficulty for this type of located AR lies in ensuring that the relationship between the digital virtual and physical real is a symbiotic one that draws positively on the technical and cultural qualities and properties inherent in both analog and digital paradigms, to fully make use of the potentials of the hybrid AR experience.

Advancements in the development of wearable head mounted displays such as Google Glass are bound to have an impact on this fledgling practice. While immersive Virtual Reality (VR) has proved to be less popular than initially imagined, we are beginning to see some renewed interest in the use of VR outside of the conventional gaming or multi-user environments. However, within the urban environment, the use of digital accessories, such as the headphones worn by cyclists or joggers that disconnect the wearer from the here and now, is still regarded with some consternation by most people. Perhaps, the key strength of the use of AR in the public realm is realized through the capacity to rapidly switch between real-world and augmented experiences as necessary and as desired and the ability to move between both a private and communal, shared experience of the urban environment.

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Chapter 16
Face Filters as Augmented Reality Art on Social Media

Jessica Herrington

16.1 Introduction

Augmented reality (AR) filters have recently become popular on social media platforms such as Instagram, Snapchat, TikTok, and on video call software such as Zoom. AR face filters are a mask-like augmented reality layer that places virtual objects on an individual's face or body. Releasing AR experiences on social media platforms has the advantage that they can be shared with a wide-ranging, diverse audience. A growing number of professional artists are creating their own AR face filters on social media to provide a new and personal art experience.

Social media platforms Instagram and Snapchat have been pioneers of AR face filters, encouraging creators to submit AR experiences on their platforms which they can easily share. Although it is becoming less common since the pandemic, there was initial criticism in the media, lamenting our connection with online art in contrast with a lack of contact with physical art experiences (Delaney 2019). Now, it can be argued that AR face filters on social media are a type of post-Internet art: art that is reliant on the use of the Internet, a type of creation that transcends new media (Bodman 2015).

This chapter will explore the development of AR face filters as a creative medium. It will also feature several artists working with AR face filters and examine how their works influence the digital creative landscape.

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16.1.1 AR Face Filters as an Artform

AR face filters are distinctive as an art form in terms of technology and how they are used. Built into a social media platform, a user must open the camera within the app to allow face detection, and the AR filter is initiated instantaneously. As the user moves their head, they can activate and change the AR face filter experience. For example, a user can often change or activate a filter with body movement, sound, or by touching the screen. Interestingly, only very brief instructions (if any at all) are provided, so exploration, experimentation and play are a large part of the process. This allows an entirely new digital portrait of the user to be created, which can be saved or shared.

Face filters as art are unique in that they are customisable, personal, real-time virtual portraits that include the physical body. This goes beyond what we typically think of as a selfie: a digital self-portrait photograph shared on social media (Souza et al. 2015). Like modern avatars in social VR, AR face filters can incorporate verbal and non-verbal modes of communication such as face and body tracking, sound activation, gestures, gaze, and facial expressions (Freeman and Maloney 2021).

Instead of the artwork existing in a specific physical location, face filter-enabled portraiture can be in many places, existing as many portraits at once. An artist can place a face filter on a face and yet make no permanent changes. In this way, AR face filters allow users to try on countless digital possibilities that may be impossible in real life. Face filters enable users to make radical changes to their appearance in digital reality without permanence or repercussions. It is immediate and reversible.

There is a vast variety of ways in which AR face filters can alter a face. Many artists take advantage of this by creating experiences and aesthetics that would be physically impossible in the real world. Often futuristic in their approach, AR artists have previously created 3D makeup, iridescent or alien-like face textures, or erased faces altogether. Ranging from the surreal and playful to the humorous and terrifying, face filters enable users to experiment with various possible selves.

Online AR art fairs have also emerged, such as the Contemporary and Digital Art Fair (CADAF),[1] exhibiting Instagram and Snapchat AR filters. The art fair operates by placing QR codes in physical locations in public spaces, which, when used, link to the AR experience (Fig. 16.1). Curator of Digital Art Month, Jess Conatser, has observed first-hand the breadth of creatives working with AR face filters, stating that: "AR is fascinating to every age and personality. I'd say most artists I work with are interested in getting into AR even if they don't understand the technology quite yet. It becomes a new and fun way to change the way you display your work".[2]

Perhaps most importantly, through creating face filters, artists are developing tools for self-expression to be experienced by the public in almost any location. Instead of creating a single experience, a user with access to face filters can share, collaborate, and express multiple versions of themselves at any time, in any place with an Internet connection. This mode of expression clearly links to more conventional creativity

[1] Contemporary and Digital Art Fair: https://cadaf.events/.

[2] Jess Conatser, personal communication, October 29, 2021.

Fig. 16.1 QR codes are used to activate AR filters in public spaces at the contemporary and digital art fair (CADAF)

methods such as self-portraiture, performance, and even gaming. Still, it brings a new twist by being individualised yet massively shareable and accessible.

16.1.2 Who Benefits from AR on Social Media?

When we use augmented reality, others (such as artists or corporations) can control our view of the world. This is because AR face filters allow us to add to and subtract from our reality. For example, a person's face could be added to with various text or imagery, or it could be blurred, covered, or otherwise unrecognisable. This leads us to question the direction AR face filter experiences will head as the technology develops and what kind of worldview this will represent. It is unclear at this stage whether developments in this area will bring sharing and collaboration, or instead, lead to a dystopian future and surveillance capitalism. Artists will be important mediators, activists, provocateurs, and leaders here. By putting AR face filter experiences in public spaces, artists will get a say in how this is played out.

Of course, there are many possible perils of face filters as AR art on social media. Due to the nature of publishing on social media, AR face filters, like other types of digital art, must abide by the platform's rules on which they are released. There may be restrictions on depicting art seen as nudity, violence, or being otherwise controversial. These rules can lead to censorship or "safe" art (Lydiate 2021), or perhaps, no art at all. In addition, certain types of AR face filters can lead to a rise in

anxiety and stress—it has been noted that AR face filters that focus on beautification can be problematic for younger users, negatively influencing their identity formation during crucial developmental periods (Pescott 2020).

A positive antidote that AR face filters could provide is helping to organise societies and bring disparate virtual worlds together. The creation of AR face filters enables artists to connect ideas with audiences worldwide easily. It has the potential to trigger the exploration and development of new types of communities that didn't previously exist. However, at present, the focus of much face filter art is on the transformation and depiction of the self in the digital realm.

16.2 Presenting the Self in AR

There are several trends and directions currently seen in AR face filters that can transform the digital self. These include the concepts of a futuristic self, identity, and cinematic narrative-style storytelling. These trends are outlined in the following sections, with an artist featured in each section.

16.2.1 The Futuristic Self-Ines Alpha

Ines Alpha[3] is an artist who creates 3D digital makeup that is wearable as augmented reality face filters. Alpha's work allows users to create their own biofictions (Kim 2019) and question what is natural and synthetic. Alpha's face filters enable us to interrogate how we live our lives and present ourselves online. By balancing between the realistic and the unreal, Alpha's face filter artworks allow us to see virtual mutations and explore the possibilities of what it means to be human.

Unlike traditional Photoshop techniques or most photograph filters, Alpha's filter artworks do not serve the sole purpose of making the user appear more beautiful, at least in a traditional sense. Many of her filters depict the user as a posthuman, futuristic vision, almost like a cyborg, extending the physical body into a realm that is impossible in real life (Fig. 16.2). For example, in her recent collaboration with artist Proxima2000[4] (Fig. 16.3), Alpha created a filter to imagine how humans might look on a planet where technologies exist in symbiosis with nature.

Similarly, Alpha's collaboration with research-led organisation Grow Your Own Cloud[5] (Fig. 16.4) to create a filter called "interspecies gossip" using 3D makeup to illustrate the symbiosis between the many microorganisms that live in our homes and on our skin. Other works, such as her filter for ImPulsTanZ,[6] a dance festival in

[3] Ines Alpha: https://www.instagram.com/ines.alpha/?hl=en and https://inesalpha.com/.

[4] Proxima2000: https://www.instagram.com/proxima2000taur/?hl=en.

[5] Grow Your Own Cloud: https://growyourown.cloud/.

[6] ImPulsTanZ: https://www.impulstanz.com/en/.

Fig. 16.2 Alpha 3D Face Makeup, an AR face filter by Ines Alpha. Created in 2020 and released on Instagram. Here, the filter is depicted being worn by the artist

Fig. 16.3 AR face filter by Ines Alpha, developed as a collaboration with fellow artist Proxima2000. Created in 2020 and released on Instagram. The filter is shown rendered on a digital model

Vienna (Fig. 16.5), expresses movement and fluidity by being audio-reactive. The concept was to help people express themselves and overcome digital public shyness through sound, dance, and new technologies.

Alpha explains that after developing 3D makeup using traditional post-production methods, she wanted to democratise the work by making it more accessible through

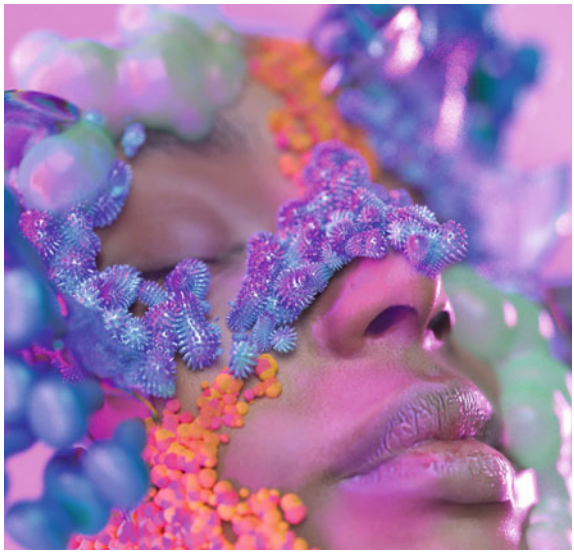

Fig. 16.4 Interspecies Gossip, an AR face filter by Ines Alpha, a collaboration with research-led organisation Grow Your Own Cloud. Created in 2021 and released on Instagram. The filter depicts colourful microorganisms and other shapes that can be worn digitally in augmented reality on the face

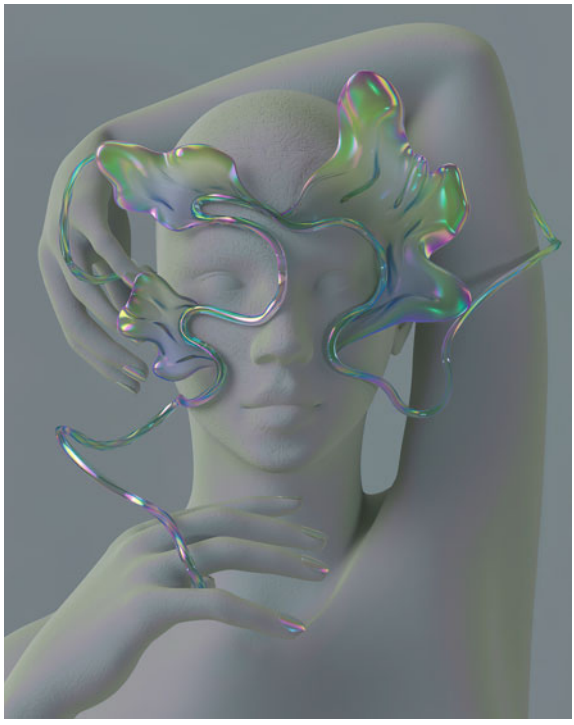

Fig. 16.5 AR face filter by Ines Alpha, developed for the dance festival ImPulsTanZ, in Vienna. Created in 2021 and released on Instagram. Here, the filter is shown rendered on a digital model

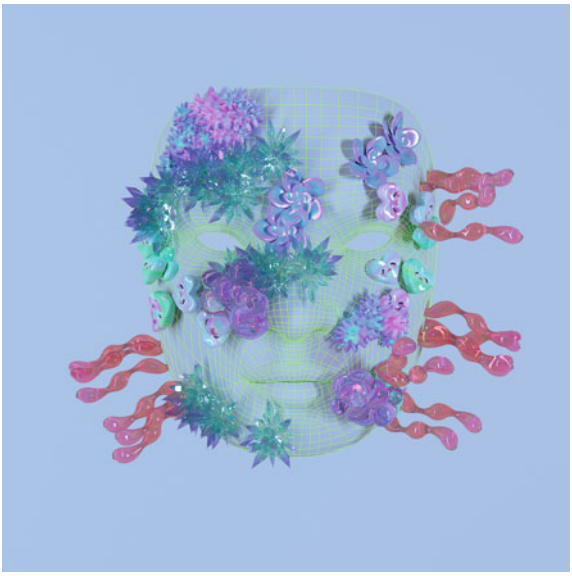

Fig. 16.6 Alpha Beauty Booth, an AR face filter by Ines Alpha, a collaboration with Savafornow. Created in 2021 and released on Snapchat. Here, the filter is shown as a 3D digital render

augmented reality. Alpha explains: "I've worked for seven years in advertising—specialising in cosmetics and beauty. I was tired of the beauty standards that are harder and harder to reach. I naturally became interested in various artists that would transform their face and body in different ways that I think we're not shown enough. Particularly, Hungry, Ryburk, Salvia, Madroni Redclock, all the drag queen and club kid scenes. I wanted to add my contribution to these people trying to push further the boundaries of beauty and makeup".[7]

On this note, the artist's work, Alpha Beauty Booth (Fig. 16.6), available as a Snapchat Lens, was created with artist Savafornow.[8] It was developed as an attempt to make the first digital makeup palette. With a choice of six different 3D elements, it allowed anyone to create digital looks using their finger as easily as they would with physical makeup.

Alpha's work highlights the importance of having a user perform the work and try on different identities. She describes her work as giving people a new tool to express themselves and show different versions of themselves to the world. It enables people to experience and have fun with different identities. She enjoys that people can tag her in videos online and see how people use her creations in their own personal ways. Alpha predicts that people will be able to express their personality without boundaries and with more aesthetic freedom in the future.

[7] Ines Alpha, personal communication, October 24th, 2021.

[8] Savafornow: https://twitter.com/savafornow?lang=en.

16.2.2 Identity and Self-aevtarperform

Aevtarperform[9] is a project by artist Cibelle Cavalli Bastos[10] whose work explores the expression of identity online. Online spaces can reflect offline realities, but often with increased visibility and a wider audience for the user. While many different challenges and experiences exist when presenting oneself online, gender identity can bring an extra layer of intricacy. For example, for a person identifying or presenting outside of their assigned gender at birth, there may be preconceptions, personal experiences, and security and privacy issues that can have both personal and professional effects both online and offline.

Yet, there is the potential for augmented reality art on social media to provide a safe space and avenue for self-expression. The development of filters as aevtarperform allows people to create stories (which may be shared publicly or privately) and be part of wider communities. The process of sharing these filters enables people to find others who also may be non-gender binary and develop awareness in the broader community.

The artist states that the AR filters serve a social function of self-assertion, visibility, empowerment, and assisting in demolishing ideas about gender aesthetics. For example, in the work EveryBodyValid (Fig. 16.7), the artist surrounds the user's face with text to illustrate the traditional pressures to uphold an aesthetic look according to our assigned gender or identified gender. Here, the artist encourages the user to visibly confront these conventional ideas and combine a user's body, their own aesthetics, and own pronoun to tackle discrimination and prejudice. In this way, avatarperform's face filters turn users into active agents involved in the co-creation of the work.

In the artist's work N ≠ BODY: EXOREAL (I) T (Fig. 16.8), the user's face is replicated and placed as multiples floating playfully in the air, appearing to represent the concept of multiple, fluid identities inherent in each person. By using aevtarperform's AR filters, people contribute to creating safer online spaces and overcoming some of the challenges faced, as often, online environments are not designed with this in mind. The artist talks of their interest in creating this work: "It was important for empowerment and awareness regarding gender and identity and helping demolish cis hetero normative and patriarchal views what it means, and looks like, to be a cis or trans woman, man, non-binary, intersex person".[11]

Interestingly, both identity and AR face filters are commonly explored while people are in their teens and early twenties. AR face filters are a technology that has been rapidly adopted by a younger demographic, with most social media users aged 18–29 years (Auxier and Anderson 2021). A reason for this could be the experimentation with identity that typically occurs in this age group. From a neuroscience perspective, using AR face filters at any stage of development is likely to be enjoyable because they tap into our strong preference for faces (Bakhshi et al. 2014). Humans are more attuned to simplifications and abstractions of faces, as seen in

[9] Aevtarperform: https://www.instagram.com/aevtarperform/?hl=en.

[10] Cibelle Cavalli Bastos: http://cibellecavallibastos.xyz/.

[11] Cibelle Cavalli Bastos, personal communication, September 30, 2021.

Fig. 16.7 EveryBodyValid, an AR face filter by Aevtar Perform. Created in 2019 and released on Instagram. Here, the artist is wearing two versions of the filter, which enables the user to change the text that appears above the head and on the face

cartoons or caricature (Mauro and Kubovy 1992). In this way, face filters may act as a simplification or abstraction of the human face, taking advantage of how our brains function. Aevtarperform's use of face filters as a tool to express gender identity keeps us engaged and, perhaps, more likely to use and share them online as a way of communicating unique aspects of ourselves.

16.2.3 The Cinematic Self-David OReilly

AR face filters have been described as a collective hallucination, a type of collaborative performance on a massive scale. David OReilly[12] is an artist whose work fits this idea by creating narrative AR filters for users to explore. He asserts that his

[12] David OReilly: https://www.instagram.com/davidoreilly/?hl=en and https://www.davidoreilly.com/.

Fig. 16.8 ≠BODY: EXOREAL (I) T, an AR face filter by Aevtar Perform. Created in 2019 and released on Instagram. Here, the artist is depicted wearing the filter that places copies of the user's face and abstract shapes playfully floating above the head. Text also appears on the face

work penetrated reality in a way he never expected, its pervasiveness akin to digital graffiti. In fact, OReilly's filters are so popular that 30 million videos were made using his filter, IT'S ALWAYS YOU (Fig. 16.9), within the first year of its release.

For AR face filters, it seems that a performer, rather than simply a user or a viewer is essential for the artwork to exist. On this, OReilly has said: "AR—like all art, is a dialog. I create the stage, but it's nothing without actors".[13] OReilly's filters are cinematic in style, taking the user on a journey to act in different roles. Using the terms "cinema" or "cinematic" to describe these AR filters is helpful to class them

[13] David OReilly, personal communication, September 21, 2021.

Fig. 16.9 IT'S ALWAYS YOU, an AR face filter by David OReilly. Created in 2019 and released on Instagram. Left: the user is depicted as royalty in nature, absorbed in their phone. Right: after panning out, the user is depicted as a planet, floating in space

as a form of creative expression composed of edited live-action moving images, emphasising artistic form or content (Kiwitt 2012).

The artist's work IT'S ALWAYS YOU (Fig. 16.9) places the user at the centre of the story, using a zoom-out mechanism to change the focus and point of view constantly. In this work, the user is moved through a looping narrative from a smaller scale to a larger scale. Here, the user exists at first on a tiny phone screen, before becoming enlarged and sitting on a sofa in the abundance of nature, to finally existing as an entire island on a planet floating in space. Importantly, OReilly's work enables people not just to wear a mask but wear a whole costume, becoming a character vastly different from oneself, part of a larger story.

Similarly, OReilly's work SIMULATION (Fig. 16.10) takes users on a journey between states of life and death. In this work, a person is transported between acting like a baby in the womb and a corpse at their funeral, tiptoeing between life and lifelessness to portray significantly different body states. This element plays with the psychology of the user, allowing them to playfully imagine themselves in new roles.

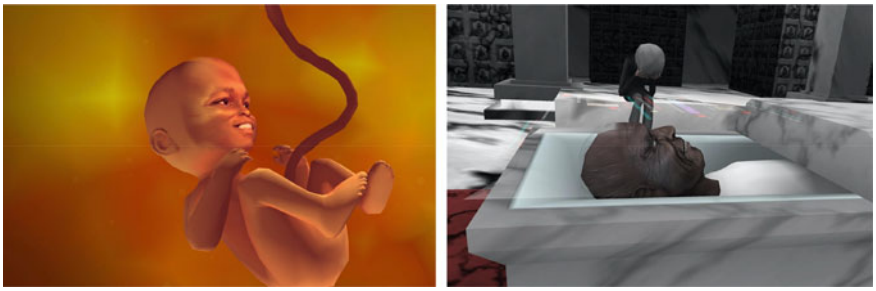

Fig. 16.10 SIMULATION, an AR face filter by David OReilly. Created in 2019 and released on Instagram. Left: the user is depicted as a baby floating in the womb. Right: the user is represented on a digital body at their own funeral

Psychological explanations can unpack why OReilly's cinematic style of AR work is so appealing. For instance, costume or mask-wearing (such as a Halloween mask) can make the wearer more confident and more likely to behave in ways that differ from mainstream social norms (Zhang et al. 2020). This contributes to the effectiveness of OReilly's work by actively adding a digital costume or character for the user to become. This is known as the Proteus effect in the digital realm, where a person's digital avatar appearance can affect their behaviours and attitudes online (Yee et al. 2009).

While few artists have experimented with narrative and cinematic elements within filters to date, the future for this mode of creativity is bright. As the technology used to create mobile devices develops, it will be possible to make even longer, more detailed experiences in AR. More creators will likely work with cinematic narrative elements. Perhaps this will bring a new movement in cinema, keeping the user at the forefront of the story.

16.3 Conclusions and Future Directions

While we are only at the beginning of this new medium, AR face filters on social media are beginning to be taken seriously as a form of post-Internet art. Face filters are distinctive as an art form due to novel technologies and how they can be shared. The emergence of digital art fairs has provided a new platform for AR face filters as dynamic, interactive artworks in public spaces. Currently, both artists and corporations benefit from AR art on social media. It is unclear what positive or negative role face filters may play as augmented reality technology develops. Artists will be crucial in shaping augmented reality online and ensuring it becomes a tool to benefit society and communities.

Ideas surrounding new ways to present a digital self are commonly found in AR face filter art created today. Many artists are beginning to use this medium to create works exploring futuristic bodies, gender identity, and cinematic storytelling

techniques to engage with audiences in new ways. Something that does not yet seem to have been explored is the creation of quieter, meditative, or spiritual experiences. While this type of experience has been utilised in virtual reality due to its immersion factor, it has not yet been designed as a face filter-based experience.

As our world becomes increasingly digital, online experiences will need to mirror how we interact with the natural world. We have five primary senses in real life—touch, taste, smell, vision, and sound. Yet, our everyday digital experiences are limited, relying entirely on visuals and audio. As technology develops, it is predicted that AR face filters will move beyond the current Internet of Things to an Internet of Senses (Ericsson 2019). It is expected that this will emerge in the next decade, moving humans from a digital screen-based world to a digital sense-based world.

AR face filters are an intriguing new part of our digital reality and influence how technology and the Internet develop. The future of AR art on social media may embody new technologies such as blockchain (Ryskeldiev et al. 2018) and artificial intelligence. These technologies may allow users to re-use and share collaboratively developed AR face filters. It may also allow an AR face filter to be tailored specifically to a single user and their preferences. Alternatively, it may enable us to interact with physical objects around us. With the constant advance of technology and what is possible, in the future, it is likely that AR face filters will radically change how we see ourselves and how artists make art.

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Chapter 17
Post-human Narrativity and Expressive Sites: Augmented and Extended Reality as Software Assemblage

Rewa Wright

17.1 Introduction

Treading a fine line between intimacy and extension, there is no doubt that mobile media devices such as tablets and smartphones have been making a serious contribution to the expressive power of human bodies. The threshold that has traditionally separated human and machine has shifted, so that the virtual and physical are no longer separate topologies, but rather embodied together in the immediacy of the everyday: the body, like the smartphone, is an interface. But, that is not all, because, bit-by-bit (or byte-by-byte) mobile media devices have been turning us into post-humans (Hayles 1999; Braidotti 2006 and 2013). It is not that the devices are some kind of Cyborgian appendage to the human body, although an argument for this could certainly be made. Rather, these new threads weaving themselves into the geo-cultural fabric of humanity are created through the increasingly dominant organisational force of software. The data network, cloud, or Internet has many uses in life, and perhaps, the least of these is artistic. Yet, it is art that is now being revolutionised by the same data networks that produced pervasive computing. Through these innovations, artists have been given the capacity to transport audiences into complex MeshWorks of narrative and experience. The pervasive use of smartphones has created many new lines of critical inquiry that intersect with notions of post-humanism, such as the shaping of human culture through a myriad of physical, embodied, and perceptual connections with the technological machines we use regularly. One such line of inquiry is posited by the radical and highly experimental artistic practice of mobile Augmented Reality Art [ARt]. When used creatively, mobile ARt acts as a vector through which to generate embodied meanings in the user-turned participant, by manifesting aspirational or progressive concepts that can perhaps be

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dreamed, shaman-like, into existence as narratives, images, and stories that suggest emergent lines of inquiry and creative modes of being in the world.

Exploring a recent selection of the most intriguing examples of mobile ARt, I will filter these through the concept of the software assemblage (Wright 2014a), using this concept as a prism through which to illuminate selected aspects of the works discussed. Here, I float the software assemblage as a theoretical formulation that may assist in articulating some of the critical lines of inquiry brought forth by experimental ARt. Built conceptually around Gilles Deleuze and Felix Guattari's conception of the machinic assemblage (1987)—which was in turn built upon Gilbert Simondon's pragmatic notion of the technical ensemble—a software assemblage is an open relational assemblage that can facilitate the complex and mutual interrelation of both concrete and virtual world systems. Deleuze and Guattari located the compositional drive of an assemblage in its capacity to attract material flows (such as those comprising people, objects, or energies) through principles of self-organisation. Primarily, a system of material elements drawn from a common technological lineage would achieve organisation by way of procedural operations vested in movement, intensity, scale, and flux. These systems were described as assemblages, since they meshed existing materials together in unexpected ways, allowing highly unique connections to emerge. Dynamic and provisional, an assemblage has a side facing 'vertical content' (control, authority, stratification) as well as a side open to new connections with other machines of expression, so that the shape of an assemblage is never fixed but always engaged in movements of re-assembly. This makes the assemblage an extremely useful strategy in regard to experimental art, with its emphasis on provisional arrangements of things rather than static models and relational compositions that use emergence to re-assemble their structures. Parallels to this way of thinking can be found in quantum physics. Deleuze and Guattari note: 'We will call an assemblage every constellation of singularities and traits deducted from the flow—selected, organised, stratified—in such a way as to converge (consistency) artificially and naturally; an assemblage, in this sense, is a veritable invention' (1987, p. 406).

17.2 AR Beyond the Information Overlay

Thinking AR as a material and relational topology is an ecologically inflected strategy that affords a position where research can remain open to shifts in AR as a dynamic system, interconnected with a range of entangled matter flows. Assemblage as a compositional force allows diverse material elements to coalesce according to particular affordances, intensities, thresholds, and attractors. An understanding of assemblage in relation to mobile ARt and the software that drives its compositions facilitates an examination of the AR medium as a nascent cultural force that has the power to leverage virtuality to shift our current perceptions, to introduce future potentials of political and ethical import into existing conversations about the material world.

Imbued with a micropolitics that explicitly values and enhances qualities of experimentation, participation, and critical inquiry, software assemblages in ARt challenge the accepted industry-driven perceptions of AR as information overlay and perhaps can operate to undo some of the trivial paradigms that have beset AR in fields such as mainstream gaming and entertainment. Shortly, we will explore some of the distinct developments made by experimental artists using ARt as a citizen-oriented form of critique. Bespoke AR by artists presents a creative opportunity to eschew the more common commercial products of the AR medium and re-position its associated technologies as companions to a radical micropolitics. Additionally, approaching ARt as a software assemblage installs a medium-specific analysis into the field and removes the need to resort to 'fine art world' terms like site-specific installation, which do not adequately convey the precise technological aspects of networked and mobile ARt. Situating itself outside of mainstream, fine art has allowed mobile ARt to take on an activist role, where it has developed the capacity to articulate concepts that have been sorely neglected by many of its institutionalised peers. From this fluid cultural position, the power dynamics that underlie many complex planetary relationships—such as those that flow between cultures, societies, economies, environments, and people—can be unfolded with accuracy and sharpness.

In the technical process of mobile ARt, the artwork itself is executed from a server, the content relayed by the network to the participant's local device and displayed on screen using an application such as Layar, BlippAR or any custom-made AR app. Notable in this process is the level of extra commitment that the viewer (turned participant) must embrace in order to engage with the artwork. Prior to the experience, they download the app, then navigate to the correct layer. This extra labour, rather than discouraging the participant, has the effect of fuelling a meaningful encounter: before they have even experienced the work, they are engaged in a relational experience that goes beyond the 'easy access' model advanced by the art museum or gallery.

17.3 Biofeedback and Décollage

Biomer Skelters (Thiel and Pappenheimer 2013—ongoing) uses the Zephyr heart rate monitor, to connect a bespoke smartphone app to the participant's heart. Networked in this way, the participant's physiological data has the capacity to trigger a virtual biome as they traverse physical space. The frequency of the signal generated by the beating rhythm of their heart is converted into the augments that populate the biome. The shifting pace of the heartbeat effects the rate these virtual plants propagate, the goal being to achieve a relaxed pace and thereby trigger the planting process. Affective computing has long experimented with embodiment, and it was from scientists at Liverpool John Moores University that Thiel and Pappenheimer received their technical guidance. However, the concept of combining an art-game form, an affective computer network, with algorithmic botany produced through AR, was a complete breakthrough. As a result, Biomer Skelters has been widely shown in a number of influential artistic research and public forums around the world (Wright 2015).

Fig. 17.1 Player of Biomer Skelters and her 'biome'. Image courtesy of the artists, Virtuale Switzerland 2015

For the participant, Biomer Skelters offers a completely new experience. As they move the camera sensor, they perceive a biome appearing around them in real time, generated by the frequency of their heart rate (Fig. 17.1). Competing with another team to propagate the most extensive biome, virtual plants are traced into the city across a physiologically inflected data network. Operating as a kind of walking self-organising system conjoining real and virtual, the participant of this art-game becomes a vital part of the 'natural' rejuvenation of the city. As the game never unfolds the same way twice, each experience is highly differentiated and multiple meanings layer on top of one another at the same geographical sites. Which species are propagated and where, who placed this biome, where are 'my' plants, where is my own map? During this active movement across an urban landscape, tangible changes are made by the participant, and each player is involved in a lively botanical re-inscription of the city. Regular people are accorded a meaningful role as ecological change makers in their own community.

In Biomer Skelters, the participant is part of a self-organising dynamic system, where their heart rate visibly generates the composition of the virtual biome. One cannot help but find a correlation between the ephemeral heart rate of the participant, where each beat overwrites the next in a constantly paced sequence, and the appearing and disappearing plant life, overwritten in the ephemera of game play, as

the competitive aspects of the game take hold. Beyond the game, Thiel and Pappenheimer's real-time re-assembly of a virtual biome has the ability to enhance some of the negative design patterns that have influenced urban environments to the occlusion of nature. By producing the conditions under which our urban concrete jungles can give way to lush, algorithmic gardens, there is a suggestion (and an implied critique) of what cities could do to improve their physical ecology. Speaking to the interventionist aspects of their practice, Pappenheimer and Thiel state:

> In the context of Wright's concept of software assemblage, we additionally foreground the artistic strategy of décollage that triggers a transformative, perceptual re-assemblage in the viewer: the tearing away or re-configuration of layers of situational assemblage to reveal meanings more profound than the superficial physical or material layers alone. It is in this sense that our work becomes an interventionist space for critical thought. Virtual augmentation therefore is not utilized to enhance or commodify objects or space, but rather to reveal problematics of public or institutional site and memory. The virtual artwork, integrated into the actual Cartesian environment that claims a specific functional or ideological territory, reveals what is otherwise hidden, functioning not merely as a technological apparition but also as an index of suppressed social objects or strata of allusion. (Pappenheimer and Thiel 2016, p. 2)

The approach taken by Thiel and Pappenheimer—both collectively and as individuals—can be discerned in earlier examples of artist led research (Thiel and Pappenheimer 2016). Especially, their methodology resonates with the Situationist International's 'detournement', as well as the radical performances of Groupe de Recherche d'Art Visuel (GRAV), whose participatory events in the streets of Paris (circa 1960) advanced an experimental art practice that exceeded prior aesthetic and cultural limits. Such artwork of the everyday removed the ego of the artist from the situation of the artwork's reception. Audiences were transposed from the passive role of viewer to the active role of participant, a shift that encouraged regular people to exceed their status as simply inhabitants of their environment and take on the mandate of change maker. In these radical performances, art took on a function that was neither aesthetic nor didactic, where participants could actively create their own version of events, their own story as the artwork itself. Experimental Art—generated by complex conjunctions of algorithms, code, and software—is a particular instance of computational logic deployed on technical devices. Those devices (be they smartphone, tablet, or another mobile media variant) have a continuous connection to a data network, the Internet, and possibly also the cloud. However, at all times, these extensive connections between technical assemblages are generated by the real-time presence of the participant, whose gesture of exploring the data embedded by geo-location spawns the material manifestations of the artwork itself. Without the participant, there can be no software assemblage.

17.4 Software Assemblages as Swarms

Tamiko Thiel's Gardens of the Anthropocene (2016) extends her work on Biomer Skelters, this time to the physical garden space hidden in various sprawling urban

ecologies. At the Olympic Sculpture Park in Seattle, Thiel geo-located swarms of invasive and indigenous plants, from bull kelp to red algae, from delicate flowers to aggressive weeds. Participants could follow the unusual behaviours of these algorithmic plants, some of which would be attached to street signs of swarm over paths, never performing quite as they should. At other locations, such as during 'the Augmented Landscape' exhibition in Salem, swarms of red algal bloom invaded the ocean, a virtual harbinger of the ecological imbalance turning healthy water systems into festering swamps (Fig. 17.2).

The unexpected nature traced as virtual by Thiel raises a number of questions about the actual relations between humans and nature in the shared ecological space of Planet Earth. How might we better nurture both plants and ourselves in an ecology that is increasingly threatened by pollution, greenhouse gases, and climate change? Offering a rare glimpse of a future where balance has given was to unbalance, Thiel's virtual ecology is far from idealised. Here, she uses décollage to provoke a visceral confrontation with the impact of human carelessness. Gardens of the Anthropocene reveal that when related to software, an assemblage is a swarm just as much as a constellation of precisely composed parts. Yet, software swarms are controllable by their programmer, and natural swarms are outside of control. In filtering the concept of uncontrollable nature through the symmetry of algorithmic structures, Thiel uses Cartesian logic to de-stabilise the prevalent conception of nature as an entity we can mould for the advancement of humanity or take for granted as an unlimited resource.

More swarm behaviour emerges in a recent work by Will Pappenheimer. Biologists speak of 'fish assemblages', where swarming behaviour across underwater topologies begets a tornado composed of aquatic bodies. Will Pappenheimer's Ascension of Cod (Fig. 17.3) is a software assemblage that interpolates a virtual fish assemblage, where

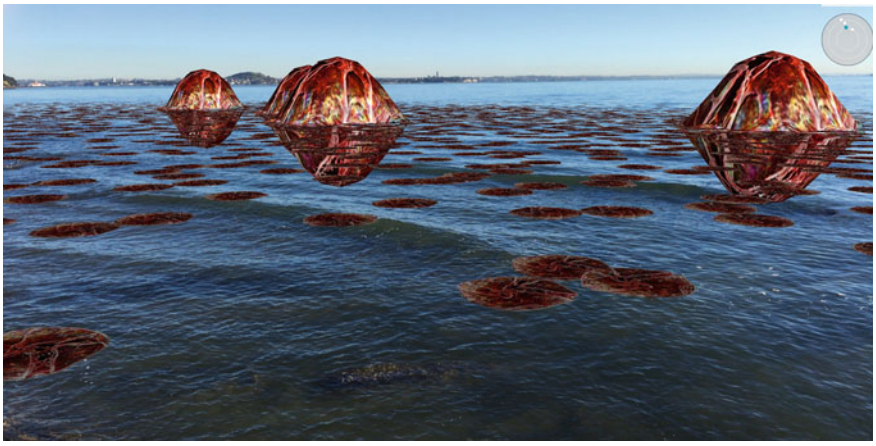

Fig. 17.2 Red algal bloom invading the Waitemata Harbour, captured by the author using 'fixed location' in the Layar browser. Auckland, New Zealand, 2017

Fig. 17.3 Pappenheimer's Ascension of Cod 2017, screen capture courtesy of the artist. Salem Maritime National Historic Site, Massachusetts, USA

the swarming of the fish is produced through the movement of algorithms. Vortex-like in their trajectory what in real-life would be an underwater tornado is deftly transposed by Pappenheimer into the sky as a meteorological event.

Pappenheimer is no stranger to atmospheric (or ARtmospheric) intervention, with his Sky Petition City 2013 (with Zachary Brady) allowing participants to write their opinions and concerns in a cloud like font across the great blue yonder. Using real-time graphics generated by a participant's handwriting, this work simulates the practice of skywriting from aviation, where temporally fleeting messages are traced by a single engine plane. In Sky Petition City, Pappenheimer and Brady designed an app to strategically place messages written by the public over key institutions in Washington D.C., coalescing on the iconic Washington Monument (Fig. 17.4).

Working on the premise that the voice of the people is too frequently neglected, the artists' sought to include the dreams, hopes, thoughts, and desires, of all who wished to participate. The message left behind operated not only as a subtle act of civil disobedience but also as an informal political forum, where the voices of a people dismissed and ignored are left in situ and accorded respect. Exploring the AR medium as a mode of critical inquiry blends digital art, affective computing, public participation, and political activism. Placing messages at the site accords the participant an interventionist role in an otherwise abstract political network. Here, ARt creates experiences that interpolate the participant in extensive and intensive sensorial modes of embodied being, modes that go beyond the normal interactions they may experience with technological networks.

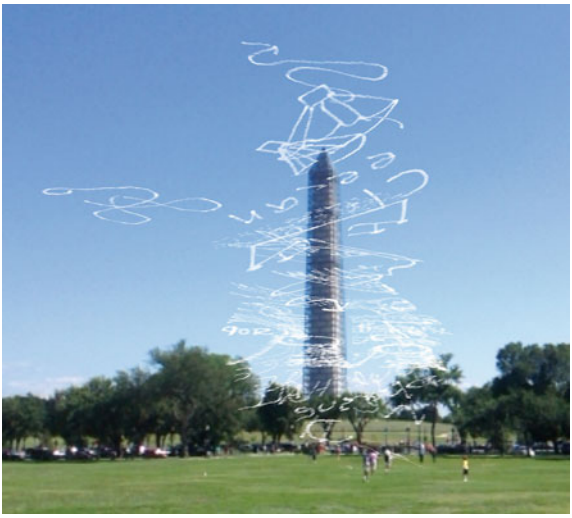

Fig. 17.4 Pappenheimer and Brady, Sky Petition City 2013, screen capture courtesy of the artists

17.5 Interventionist Portals

A recurring interest in John Craig Freeman's work is his use of visual imaging technologies such as photography, in combination with its digital offspring photogrammetry, to instantiate virtual portals that link diverse geographical locations. Part-icon, part-totem, these portals trigger a situational MeshWorks that illuminates the specific cultural concerns of the people and places whose images they convey. Portals can be either physical sculptural structures—as Freeman has made in San Jose and New York—or purely virtual ones. In a sense, however, even the virtual portals are already physical, because the mobile device needed to access them is itself an object with a screen linked to a network: the phone itself becomes the iconographic portal to another dimension. Places as different as Taipei, Wuhan, Mexico, Arizona, Switzerland, and Russia have been imaged by Freeman, images which are then incorporated into AR to be viewed either at the location of the art experience or by 'remote location' using the Layar browser.

Paseo Portal, Securing the Virtual Border (Fig. 17.5) is designed as an 'access point' (Freeman 2017) through which the public can encounter people they would not normally come across: the disenfranchised, the homeless, those displaced by the spiralling housing shortage, and those who have fallen with no safety net to catch them. Approaching these citizens as more than just statistics, Freeman's work aims to produce actual meaningful encounters between their culture and ours. Leveraging virtuality to articulate the occluded circumstances of the denied and downtrodden allows the (privileged) viewer a reflexive space through which to explore the troubled waters of this urban culture of displacement, a culture that they may not encounter in real life, and which has become, shockingly, accepted as the norm. The portal is a meeting place between the cultures of the viewer and the imaged and generates a

Fig. 17.5 John Craig Freeman, *Paseo Portal*, screen capture courtesy of the artist, 2017

visceral encounter when accessed through the realist imaging of photogrammetry, as well as the lifelike qualities afforded by AR as a communication medium. In this space, the participant to such experiences takes away the memory of their virtual encounter, to reflect on and retain long after the ARt experience has ended (such as Freeman, Things We Have Lost (2013)). In so doing, the artwork is complicit in activating a micropolitics that goes beyond pure aesthetics to reveal the submerged realities of urban society, bubbling through the material flows of an ARt that asks 'why'. For those of us who have never experienced such a dramatic displacement as homelessness, an unseen perspective emerges, nascent with questions and begging further answers. Perhaps, such artwork holds the power to shift public opinions crystallised by a lack of contact with homeless culture? Through this portal, we are able to access the struggles of a body of citizens caste out from power, a forgotten polis disenfranchised from their rightful access to civic well-being.

In *Virtual Russia* and *Virtual China* (2017), Freeman geo-located virtual portals captured on location in St. Petersburg, Russia, and Wuhan, China, at the Salem Maritime National Historic Site in Massachusetts (Fig. 17.6). These multi-layered geographies are not merely topographical: rather, they are a precise comment on the geo-political tensions between local and global and manifest in many contemporary nation states. Freeman comments:

> During its early history, the Port of Salem conducted trade with both the Baltic and China. This history is relevant today as the world struggles to reconcile the discord between globalization

Fig. 17.6 John Craig Freeman, *Virtual Russia* and *Virtual China*, screen capture courtesy of the artist, 2017

> and the rise of nationalistic protection and isolationism. We tend to think of globalization as if it were something new. (Artist's statement 2017)

Freeman's work brings diverse events together as narratives that overlap and inform one another to evoke shared stories from multiple perspectives. In assembling these images as living events rather than historical narratives, Freeman's AR experiences encourage the participant to use their own analytic and expressive thinking, to involve themselves in the story as a co-construction with the artist.

Freeman's practice in AR is connected to his earlier networked art (from 1997) with the Florida Research Ensemble (FRE), where his contribution to the project Imaging Place: Miami River developed sophisticated methods of socio-cultural art making that incorporated documentary, environmental imaging, archival collection, and mapmaking methods. Interestingly, Will Pappenheimer was also part of FRE from 2001, locating both artists in a socially engaged practice of inquiry. Gregory Ulmer, the eminent theorist of the group, has written extensively on choragraphy and electracy (Ulmer 2002; Ulmer et al. 2012; Ulmer and Freeman 2014) and through practice-led artistic research with FRE, attempted to produce a method for choragraphic research in art. Freeman explains the method:

> Chora is the organizing space through which rhetoric relates living memory to artificial memory. It is the relation of region to place. Chora gathers multiple topics associated with a geographical region into a scene whose coherence is provided by an atmosphere. This atmosphere or mood is an emergent quality resulting in an unforeseeable way from the combination of topics interfering and interacting with one another. (Freeman 2008)

The enduring influence of Ulmer's electracy on Freeman and Pappenheimer, who went on to introduce those conceptual threads into ARt, can be seen in Freeman's interest in developing an understanding of electracy that could reach outside of academia and Pappenheimer's interest in networked memorials. This seed of chora, migrated via Ulmer, has certainly assisted in the relatively fast progression of ARt as a citizen-oriented cultural form and an activist practice. Ulmer's eschewal of an art of pure aesthetics, and his proactive shaping of the Internet as a civic sphere, influenced

artists like Freeman and Pappenheimer, who along with many other members of Manifest.AR have contributed to the fine-tuning of ARt as a radical formation, latent with the potential to influence public opinion towards ethical practices of culture and society.

One of Pappenheimer's collaborative works with Ulmer was a 'MEmorial' (Ulmer 2005) called 'Soft Wishing Y', designed as a networked memorial to 9/11. Situated simultaneously online and physically in New York City, thousands of orange pom-poms were networked in the formation of a giant wishbone or letter Y. Ulmer has theorised the making of MEmorial's as a powerful instantiation of chora, where people use the Internet as a potent civic sphere. Using mapping and textual techniques to create personal monuments adds the people's voice to what are often abstract political events, affording a space for the specificity of local experience to shine through. In this sphere, networked art becomes a communal modality that can help process incomprehensible acts. Here, social conscience conjoins with an aesthetics attuned to the people, using strategies that shift to accommodate an engagement with the issues at hand. Mapping, walking, tracing events through images, or placing symbols (such as the pom-pom) as virtual data and in the physical world are all examples of the various strategies used in this form of networked art. Such practices aim to pull the public towards more challenging forms of engagement, like the making of a personal story as art itself. The personalisation of politics becomes a way to re-assemble a multitude of potentially pressing questions, be they cultural, ethical, or political. Isolation is the enemy of networks. Crucially, the public are engaged not simply as an audience, but as agential to the production of the artwork, whose aim is to draw these participants into vocalising their concerns in the civic sphere (Pappenheimer and Ulmer 2001). Now, more than ever, as we find ourselves in an increasingly tumultuous geo-political landscape, the imperative of social critique filtered through a culturally engaged aesthetics brings with it a powerful imperative to act. Action, in the context of ARt, is not didactic or dogmatic; it is creative and involved with culture from the inside out.

Take, for example Will Pappenheimer's recent series Boon (2016–17) an augmented artwork that envelopes the participant in an unseen aura, as they are simultaneously pictured in the frame of a tablet or smartphone by their co-participant. Pappenheimer reveals:

> These invisible body works offer contemporary Dada relief and protection against very bad psycho-political conditions staining our consciousness these days. (Artist's statement 2017)

Neurosis and anxiety are psychological disturbances that are metaphysically associated with this current phase of Late Capitalism and, further, intersect with the relationship between humans and technology in urban landscapes permeated by the invisible topologies of ubiquitous computing. Such topologies include, on the surface, a swathe of easy entertainment paradigms—Youtube, Snapchat, Facebook, and many others—as well as the ever present but unseen networks of surveillance and their wider relationship to vectors of algorithmic control. From this milieu, it seems especially appropriate that *Boon* (Fig. 17.7) should emerge, as a burst of translucent light from the belly of one of the world's great mega-cities, New York. In an age

Fig. 17.7 *Boon* 3, participant wearing the Boon button is surrounded by an aura. New York Moving Image Fair, 2017. Image courtesy of the artist

where algorithmic control has come to define many of our public spaces in the name of good governance, *Boon* opens up a space of resistance.

17.6 Through a Lens, Darkly

The high-profile sale by Christies of its first Mixed Reality (MR) artwork, The Life by seminal performance artist Marina Abramović, draws attention to this emergent field of practice and not only because of its 600,000 pound price tag. Transposed to MR, critics of the work argued that Abramović's monumental physical presence, often apprehended in the silence that captivates in her live performances, did not translate well to the MR space, illustrating the difficulty of investigating embodiment as a digitally captured mode of materiality. The Life used augmented overlays registered in three dimensions as holograms, to re-situate Abramović's physical presence as virtual, viewed through cutting-edge Magic Leap mixed reality goggles. Abramović's affinity with virtual technology goes deep, with works such as Rising challenging participants to take the fate of an anonymous future being/avatar into their hands. As a Titan of performance art, Abramović's keen engagement in the

mixed and virtual reality space undoubtedly signals a future boon. However, this mode of audience-led performance has been functioning at a smaller scale in media art circles for some decades, having been investigated in participatory artworks since Myron Krueger's Videoplace (1975). In the decades since MR stepped out of the laboratory, prosumer level devices paired with customisable software have operated to establish accessible pathways in art practice. The Life was a bold experiment with 'bleeding-edge' technology, yet unfortunately some critics stalled their impressions at what they experienced as eye-watering visual glitches mediating the artist's 'live' embodiment.

Examining the most pervasive devices for mixed reality reveals an overarching expectation of ocular privilege: which we shall call the 'clear window'. Articulated through enterprise-driven hardware interfaces such as Microsoft HoloLens, Magic Leap, goggles are intended to enhance our human visual system with graphic overlays that engage the wearer in a combinatory perception of physical world and technological virtual. In this sense the clear window afforded by mixed reality (MR) headsets of various manufacture, all propose a design pathway that eschews the immersion presupposed by head-mounted virtual reality. This has the obvious advantage of not replicating the sensory isolation of VR, where wearers can feel discombobulated from their other senses, triggering nausea in some wearers. However, while MR enacts a lighter touch, on the human sensorium, the seemingly gentler approach of the 'clear window' paradigm is designed to privilege perspectival alignment, while conjuring illusions of presence. However, due to technological limitations in current headsets, devices are not nearly as capable at creating an illusion of a 'clear window' as the human brain. Even with the best articulation of the clear window paradigm, current MR technology is less than impressive.

In some ways, the clear window paradigm speaks to our visual dominance as bi-pedal mammals, since we are used to the near seamless perceptual integration of world and object. The mediating (or glitchy) qualities of technical devices like the Magic Leap are immediately correlated by our body-brain as inferior, extirpated as faulty. Like the emergent twin of a flickering techno-bio experiment, Abramovic's avatar seemed to form a spiritual alliance with Donna Haraway's posthuman cyborg woman: the unpremeditated phenomena of a visceral experiment. Placing The Life aside, staying with this trouble leads to a wider question. If the affordances of the highest tech contemporary MR devices are quickly discarded by our much more advanced body-brain network as mere faulty robots serving a cold dish of uncanny glitch, how might we further cultivate unholy alliances between body-brain and machine: perhaps another path emerges in dark vision?

17.7 Touching Signals in the Grayscale Gloom

Since the 1990s, the extreme quality now possible with scientific imaging equipment such as electron microscopes has allowed us to see within previously opaque natural structures. Yet, this seeming clarity has also problematised relations with

other species. A visually illuminated knowledge of plant processes has afforded a greater understanding of their sensing capacities challenging previously held notions of plants as passive. Acknowledging the embodied processes of two modes of situated agency (plant and human) and how situated and specific processes generate disparate affects, on bodies, as well enfolds thinking that understands plants as co-creators. In our performance, this emerges as a tangled network of augmented reality infrared vision, gestural, and signaletic data, connected by electrical signal and audibly through a bespoke soundscape.

How can we configure differing conjunctions of technological apparatus so that we experience differently? In Rewa Wright and Simon Howden's installation and performance *Contact/Sense* (2019), wearing a modified HTC Vive with a Leap Motion gestural interface, a human with de-limited vision, feels her way through an improvised performance with an agave attenuata plant. This plant, whose arhythmic chorus blends with the micro-temporality of algorithms emanating from custom software (Unity 3D and Touch Designer), generates not only an emergent sonics, but also co-creates 3D modelled trails which attach to the human performers hands as augments in an Extended Reality (XR) network. Touching one another's signals, human and plant deliver a responsive oratorio. In the artwork *Contact/Sense*, participants were able to co-compose alongside plants, whose sonified bio-electrical signal inspired human improvisations (Fig. 17.8). In real-time piece (an installation and a performance), plant signals came first leading the co-composition. Participants who experienced the installation explored their own tactile and gestural experience of co-composition. Looking through the Leap Motion gestural controller as a camera, participants saw in XR with grayscale vision, their vision de-limited and other senses

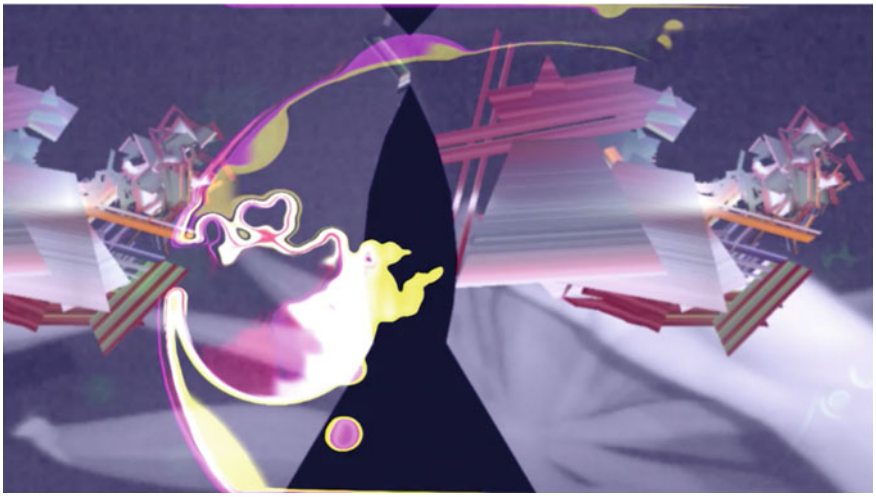

Fig. 17.8 *Contact/Sense* installation: head-mounted display of performer's stereo vision, near-field infrared vision (grayscale) with abstract augments generated by human hand movements and plant-bio-electrical data. SIGGRAPH Asia Art Gallery 2019, Brisbane, Australia

enhanced. Reassembling data and human gesture using plant signals contributes to an emerging perception that a plant might also be considered as a 'body' in momentum, just operating at a much slower time scale than with humans and other animals.

Utilising the Leap motion gestural controller in a non-standard implementation, it became a look-through the camera, affording a de-limited mode of vision that eliminates all colour. Seeing the world through this grayscale gloom, the wearer is engulfed in an occlusive vision that challenges the ocular. Wright and Howden's work in XR generates an intra-active network where plants have the first signal in the performance and lead the human performers to improvise alongside their signals.

17.8 Closing Remarks

Mobile ARt and XR art are an experimental cultural practice has emerged as a critical phlanx to block the onslaught of both the banal virtuality advanced by industrial AR and also of the more timid participatory artwork produced by the fine art world, where ideas are softened as not to offend, curated so heavily as to provoke a loss of political vitality. As a proactive mode of interrogative artmaking for and by a social corpus whose electrate fluency is ever increasing, mobile ARt and XR art is of crucial importance. Following on from the affordances of mobility, XR offers extensions of the virtual across physical topologies. It generates further connections to portable hardware devices such as the HTC Vive head-mounted display and gestural controllers like the Leap Motion. As I have traced its material topology, the concept of the software assemblage offers a strategy for articulating the nuances of ARt and XR art and has the capacity to evoke, in a relational way, a myriad of technical, aesthetic, and affective concerns that relate the body, mobile devices, and software to the vibrant milieu of early twenty-first-century urban culture. The software assemblage offers an extension to, yet is contra distinct from, conventional art world terms such as 'site-specific installation', imported from traditional fine art and often blindly applied to ephemeral technological art. It offers an alternative way of thinking that explicates the special role of software in creating the participatory experiences that cause mobile ARt and XR art to flourish and the special place of assemblages in contemporary life (Wright 2014b and 2016). In the context of its attraction and attachment to the material flows of all adjacent forces and energies, the assemblage holds a capacity to harness relational movements (be they political, cultural, or otherwise) that disrupt the accepted order. It is this nuance of assemblage that I have picked up on here—the ability to re-assemble a material or conceptual flow based on the desire and capacity of the forces involved to engage with one another. In ARt and XR art as software assemblage, such forces are algorithmic, machinic, human, environmental, networked, and nascent in all aspects of culture and society at a planetary level (Wright and Howden 2020).

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Part IV
Historical, Cultural and Personal Engagement with Augmented Reality Art

Chapter 18
User Engagement Continuum: From Art Exploration to Remixing Culture with Augmented Reality

Matjaž Kljun, Paul Coulton, and Klen Čopič Pucihar

18.1 Introduction

Moving through display rooms of galleries or museums, and passively observing the exhibited works, is an accepted practice in terms of artwork preservation. However, it also limits the potential engagement with visitors who could use the observed artworks as inspiration to express their own creativity, build upon them and meaningfully appropriate them. The so-called remix or mashup culture has been the core of innovation and creativity and will remain more than ever in the digital world. It can be expressed by the now famous quote 'good artists copy; great artists 'steal" often attributed to Pablo Picasso. The idea of remix or mashup culture lies in the process of selecting elements from existing works or designs, building upon them, forging and incorporating them into a mix of one's own influences, reframing the original narrative, reinventing the existing in novel ways. Augmented reality (AR) has the potential to enable digital appropriation and remixing of physical exhibitions while leaving physical works intact.

The number of AR applications and prototypes in the field of art and cultural heritage is growing as can be seen in Chap. 1 of this book. Nevertheless, the vast majority of these are guides (Caarls et al. 2009; Miyashita et al. 2008; Papagiannakis et al. 2005; Tillon et al. 2011), provide alternate representations of the

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museum content and additional metadata (Angelopoulou et al. 2012), create predefined different representations of artworks such as 3D and animations (Kolstee and van Eck 2011), provide alternate infrared or ultraviolet views of artworks (van Eck and Kolstee 2012; Kolstee and van Eck 2011), or link and show AR artefacts located in a remote museum while visiting an archaeological site (Law 2018). Such AR applications also aim to enhance learning (Law 2018; tom Dieck et al. 2018) or influence purchasing practices (He et al. 2018). However, they rarely support the creativity of users while they are observing the works of art. AR is also often explored from a technological perspective pushing the boundaries by exploring novel capabilities in tracking, interaction, calibration, rendering and displays (Kim et al. 2018).

The advantage of AR, compared to other mediums, is that AR allows to blend existing physical artefacts with digital content in real time. This provides AR applications with a rarely exploited advantage of supporting users in real-time changing, adapting, remixing, mashing-up, personifying and personalising artworks by digitally augmenting them, all the while physically preserving them as well. Augmented art objects can be then observed by their creators, people with whom these augmented artworks are shared (e.g. with co-located visitors or even people on social media sites), and people interested in what others have made publicly available by searching for and exploring digital traces others have left where artworks are shown and observed (e.g. galleries, museums, cities, etc.). AR presents an excellent opportunity to allow users to play with art in a personalised way, allow them to be creative and explore art not only as passive observers but rather as active participants.

In this chapter, we present different ways in which users can engage with art content by utilising AR through the consideration of a number of different prototypes that support expression of users' creativity at different levels. We will not focus on how these solutions have been implemented since technology advances at a fast pace and each of the below solutions could be built in novel ways with novel technologies (e.g. hands-free headsets) that since entered the market (e.g. Microsoft HoloLens 2,[1] MagicLeap One,[2] or Lenovo ThinkReality A3,[3] more affordable Mira Prism Pro[4] and a plethora of similar products). Rather, we will consider the potential of these examples, use cases and results of the studies.

18.2 AR Use Cases for Engaging Users in Art Creation and Consumption

There are several ways in which users can engage with art and cultural heritage and creatively expand it. Below are described some examples of AR applications that allow for exploration, creation and building upon artworks, whole exhibitions and

[1] https://www.microsoft.com/en-us/hololens.

[2] https://www.magicleap.com/.

[3] https://www.lenovo.com/thinkrealitya3/.

[4] https://www.mirareality.com/.

other artefacts as well as try to engage users in novel forms. Note that this is not a definite collection as describing all such prototypes would exceed the purpose of this chapter. For some other AR solutions, see Chap. 1 of this book about AR application taxonomy.

18.2.1 Taking the Artwork Home—User Curated AR Art Exhibitions

Displays and exhibits of artwork collections in the museums and galleries are most commonly left to art curators employed specifically for this job. Visitors have thus the possibility to see the curator's interpretation of what is being displayed in the context of a physical environment in which the exhibition is held. Curators often hold high academic titles meaning they have spent years acquiring the required knowledge for this job. Nevertheless, researchers have explored, for example, the idea of children curating the engaging AR material within a museum for their peers (Sim et al. 2018). The results of a workshop show that crowdsourcing ideas for an AR exhibit within a museum in which children were enabled to design low-fidelity interfaces and interactions works to some extent.

The authors of the *Taking the Artwork Home* application for handheld AR mobile devices (smartphones and tablet computers) have given visitors of a gallery the possibility to 'take' home digital representations of the seen artworks and curate them in their own homes (Coulton et al. 2014a, b) since visitors are also 'curators' of their own living spaces. To create their curated exhibitions, users can either define their own AR markers (e.g. existing paintings they have on the walls of their home) or use predefined markers (Fig. 18.1). Next, the artworks need to be selected and the exhibition needs to be given a name and description (Fig. 18.2). At this point, users can also define how they wish the artwork to be displayed in relation to the AR marker. There are four display options available: proportional to the height of the marker; proportional to the width of the marker; display at the original dimensions; and define a custom display size.

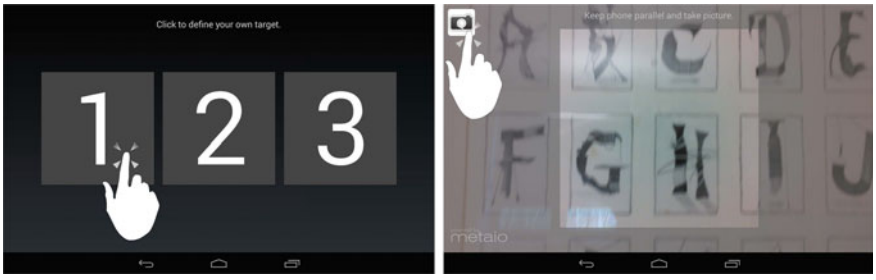

Fig. 18.1 Taking the Artwork Home application: defining AR markers

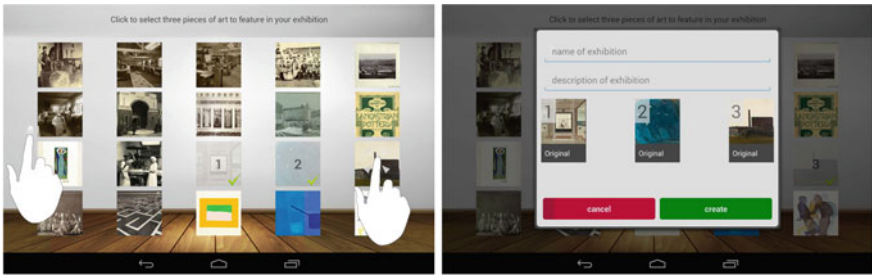

Fig. 18.2 Taking the Artwork Home application: creating exhibition—selecting artworks to be displayed, giving the name and description to the gallery and selecting the display relation to AR markers

To view an exhibition, users select one of the exhibitions they created or one created by the community. Once an exhibition has been selected, it can be viewed by pressing the view button. Digital representations of the artworks are then displayed over the markers for the user.

The main goal of this prototype was to study the implications it would have on users, artists and galleries. The results have shown that users engaged more with the content in the application than with the content in the gallery. They, for example, enjoyed the possibility to zoom in the artworks, explore them in great detail such as observing brush strokes within the paint and rotate artworks as they desired. In contrast, observing artworks in the gallery space allowed them only to passively acknowledge that there is a painting. While users enjoyed using the app, the gallery and artists in the study were concerned about copyright and privacy issues, which are complex enough to be obliged in one country, let alone globally.

18.2.2 Playing with the Artworks

During organised school trips to museums and galleries, children are often given working sheets, are expected to describe the exhibited material, write down answers to questions related to the exhibit and/or write an essay about the trip. These tasks bear a high notion of seriousness, which children and youngsters generally dislike. The participants in the study conducted by Čopič Pucihar et al. (2016b) emphasised their positive experiences when such visits were interactive and playful. One of the examples given was playing a game in the museum in which children were given parts of exhibited paintings in the form of puzzle pieces and had to go through the museum to find which paintings they belonged to.

Based on the results, the authors aimed to create engaging and personal art experiences for younger audiences using AR (Čopič Pucihar et al. 2016b). To achieve this, they developed an AR application *Playing with the artworks* that incorporates a treasure hunt style game. The game starts by assigning users a contour of indefinable

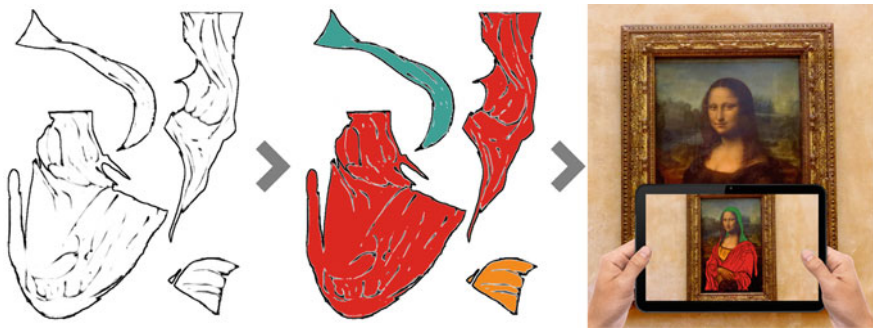

Fig. 18.3 *Playing with the artwork*s. User colours a given contour. After finding the corresponding artwork, the patches from the contour wrap onto it creating a unique personalised version of the artwork

objects, which they are asked to colour. Thus, users do not know exactly what objects they are colouring, but are made aware that these segments will overlay a painting in the exhibition (see Fig. 18.3).

Once a contour is coloured, each user embarks on a treasure hunt through the exhibition and tries to fit the coloured contour to various artworks by pointing the AR device at the object. The device identifies the artwork, presents the user with the object's information (i.e. audio and/or text) and notifies them if the contour matches the artwork. If the contour does not match, the user is given extra information to lead them to the artwork or simply be encouraged to keep exploring. If the matching artwork is identified, the coloured patches from the contour are overlaid over the artwork to create a unique personalised version of it. This can be also saved and shared online. The application was expanded to the 3D domain (Weerasinghe et al. 2021) to include sculptures, buildings, paintings, statues and other 3D objects as shown in Fig. 18.4.

The idea behind *Playing with the artworks* application is the concept of playful learning by engaging users in active participation rather than passive consumption

Fig. 18.4 *Playing with the artworks* for 3D objects: left—two objects (ukulele and a portrait bust) and a contour on the desk. Centre and right: a portrait bust with the virtual mesh upon which the coloured contour is mapped

(Bruner and Lufburrow 1963). It gives children the opportunity to actively explore and creatively expand on existing artworks. For example, by colouring contours children can think about geometry, underlying shapes, forms and particular elements that form the basis of the artwork. In addition, the application offers a possibility to provide audio or video information, context-aware quizzes and similar multimedia that children are supposed to see or solve in order to proceed and/or gain points in the game.

18.2.3 Time-wARp Xplorer: Creating Own Stories in Urban Environment

Numerous prototypes use AR for navigation, search and augmenting historical artefacts (see Chap. 1 of this book) using location-based services (LBSs). For example, *Time-WARp Xplorer (TARX)* (Lochrie et al. 2013) is intended to be used by users that are exploring a city of Lancaster, UK. By default, the AR application offers a collection of historical photographs provided by the local museum that users can explore in an AR view. More precisely, it enables users to explore the city in spatial and temporal dimensions in a playful manner by discovering the cracks within the history over a modern-day city with augmented photographs of historical locations over the present-day physical locations (see Fig. 18.5 right).

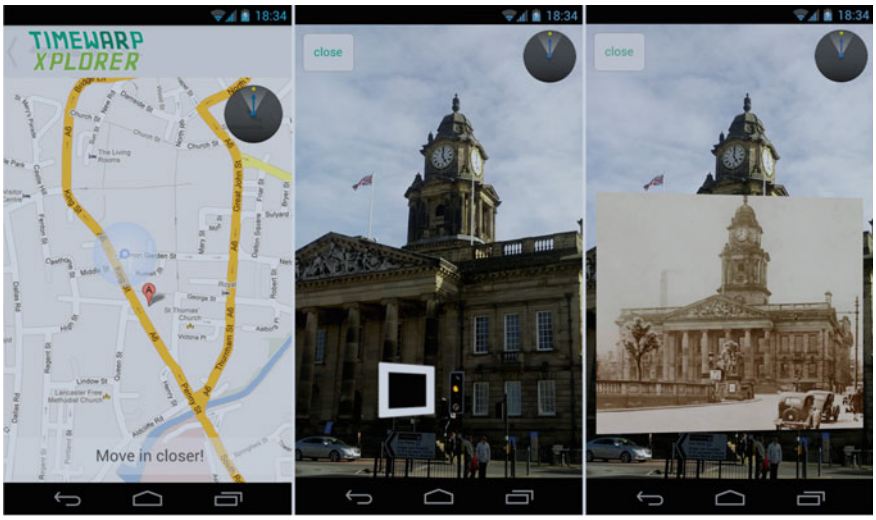

Fig. 18.5 TARX application: map, AR and warp view. *TARX* has an automatic interface switching implemented, to switch the AR view to a traditional map view based on the orientation of the device to save battery life

Additionally, the application provides a platform for the local community to expand the collection by adding their own stories and accounts of the history of their living spaces. This (i) provides a sense of ownership, (ii) increases the perspective of varying photographs, (iii) encourages audiences to supply a piece of history and (iv) permits for a variety of personal interpretations and point of interests (POIs) from the local population about their living environment. Users can contribute personal historical photographs (e.g. of a family-run business, their school when they were children, etc.). For each photograph, they can provide a name of the location, a brief description, a date when it was taken, latitude and longitude, the direction from where it was taken, as well as its incline.

The interaction with the application is visible in Fig. 18.5. Upon arrival at the warp destination, users have the ability to warp back in time by clicking on the marker to reveal the augmented photographer (see Fig. 18.5 centre). Users can also view other details such as the location, a brief description and information about the warp, and have the ability to store the photographs and data in their own sticker album, enabling them to revisit the warp. Players can share these stickers by posting them to several social networking service sites. Users can also be awarded achievements and ranks by fulfilling application objectives. The tracked journey and achievements can be saved as a digital souvenir.

18.2.4 I Was Here: Digital Graffiti for Tourists

Since ancient times, travellers and tourists have been leaving marks and writings on sites they visit. This is manifested across cultures and covers everything from building simple piles of rock such as cairns or inuksuit, hanging locks with declarations and messages on bridges in cities all over the world, to scribbled messages on the walls of ancient buildings denoting one's presence and appreciation of the site. The latter are unacceptable acts by today's standards since this kind of behaviour can leave permanent and irreversible damage on historical sites (Wu and Guo 2018).

One possible solution to prevent such permanent marks on historic landmarks is to use AR and allow tourists to create their mark in a digital form and append it on a desired location of the historic site (Kljun and Čopič Pucihar 2015) or to create digital graffiti directly on the wall of the historic site (Šimer et al. 2016) as shown in Fig. 18.6.

The intention of the prototype *I was here* was to explore how would its usage be accepted by collocated users while a graffito was being made as well as how would people react seeing such a graffito on social media sites. People walking in front of the AR device (a phone in this example) have not been bothered by the author despite holding the phone in the air for prolonged periods of time to create the desired graffito. This graffito also received positive feedback online: the author's friends have wondered about the technology and asked about the origin of the captured images.

Fig. 18.6 Digital graffiti as seen through the AR device and *I was here* application on the wall of a historic landmark

Similar solutions have already been developed and made commercially available such as the *Autography*[5] application from 2017. The application allows users to leave digital graffiti on the walls of the Giotto's bell tower and Brunelleschi's Dome (of the cathedral) in Florence. These virtual marks are saved and can be seen by other visitors. In 2018, the Museum of Florence showcased the best works selected by the jury at a special temporary exhibition. Another similar application is *Paint Job*[6] (developed by the creative agency Brilliant After Breakfast) that allows users to digitally augment pictures of the Rijksmuseum in Amsterdam as shown in Fig. 18.7. It allowed exploring issues of copyright, remixing existing artworks and creativity.

The number of applications that enable users to create or hide virtual AR messages, notes or any other content in the physical environment is growing in the online repositories. While these do not focus on the galleries, museums or cultural heritage sites, they can be used in these spaces as well. Examples include among others *Real Note—Social AR Network*,[7] *LandmARk*[8] and *Notes AR AllPurposeNotes*.[9]

[5] https://duomo.firenze.it/en/opera-magazine/post/4471/sketch-the-dome-celebrate-the-dome-with-your-digital-creation.

[6] https://theinspirationroom.com/daily/2012/rijksmuseum-paint-job/.

[7] https://play.google.com/store/apps/details?id=one.realnote.app.

[8] https://play.google.com/store/apps/details?id=com.mitchellaugustin.landmark.android.

[9] https://play.google.com/store/apps/details?id=com.wally.augmented_reality_virtual_notes.

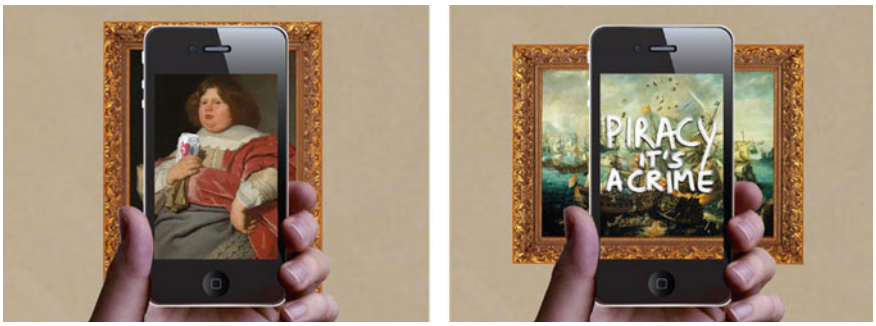

Fig. 18.7 Digital augmentations of artworks in Rijksmuseum in 2012 using a Paint Job application. Photographs courtesy of Duncan Macleod (see footnote 6). Used with permission

18.2.5 Virtual Tracing Tool

The *Virtual Tracing* tool allows users to transfer any contour onto a 2D (Čopič Pucihar et al. 2016a) or 3D (Gombač et al. 2016) surface as shown in Fig. 18.8. Looking through the screen of a handheld device, users can see the contour on the display that can be transferred to the surface seen through the screen. This approach can be used for a variety of purposes, one of which is recreating the artworks and supporting art generation and/or reinterpretation. For example, a virtual tracing application has the potential to serve crafting communities and support expert users with complex contours while also improving drawing abilities of novice users.

Besides virtual tracing images to a surface, we can envision applications that assist users in sculpturing. For example, users would have a piece of clay in front of them and looking at it through an AR device, and they would be guided as to where to add or take the material to achieve a desired result seen through the screen. The shapes

Fig. 18.8 Mobile device renders a virtual template image together with a live video stream of the drawing surface. Left: paper. Right: Easter egg

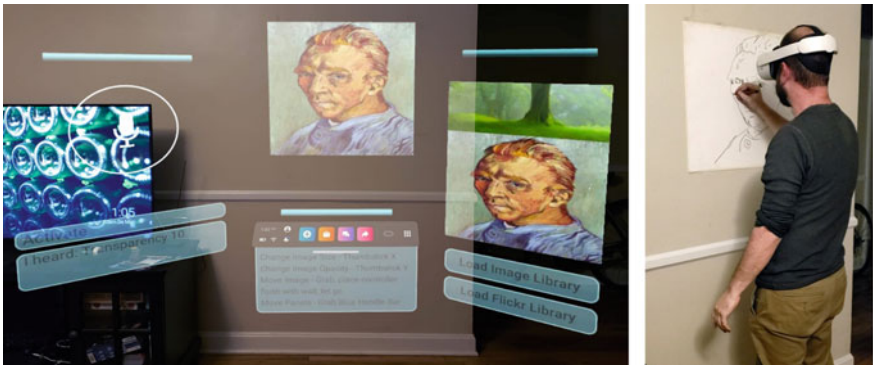

Fig. 18.9 Easily AR prototype allowing users to project any photograph or painting on a selected surface in order to recreate it. Photograph courtesy of Richard Hoagland and Al Baker (see footnote 11). Used with permission

of sculptures could be the works of art in a gallery, and users would be encouraged to recreate and/or adapt them.

In 2017, a commercial application SketchAR[10] supporting virtual tracing through the phone's screen has been released. It is advertised as an art assistant useful for all users who cannot draw but want to start with such activities as well as for professional artists, as a fast way to trace sketches to a chosen surface. Its database contains a collection of various sketches including works of art, which users can transfer to the physical surface. A similar idea named Easely[11] was presented in 2021 Facebook's XR Hackathon. The authors used a head-mounted display (HMD) instead of a handheld device as in previous examples. Instead of providing a simple contour, the app allows users to position any picture on a selected surface, set the size and transparency and start sketching as shown in Fig. 18.9.

Virtual tracing presents an example of how users can be supported in building upon existing artworks and be engaged in adding their physical content or leaving (even temporarily) their physical marks at museums or galleries.

18.2.6 Novel Ideas, Technologies and AI

With the rise of various AI techniques in recent years, several possibilities have been explored and shown that can or could be used in AR to enhance, ease or support art engagement and remixing culture. The umbrella term for computer-generated,

[10] https://sketchar.io/features/.

[11] https://xr2021.facebookhackathons.com/#/projects/619adb4b4e4b6904f6c484a9 and https://github.com/RalphVR/easely-meta-hackathon.

automatically manipulated or modified media is synthetic media, or AI-generated, generative, organic, personalised media. Colloquially, the term deepfakes is also often used.

For example, researchers have developed techniques that allow people to amplify their artistic sense with a possibility to transfer artistic (Chen et al. 2017) and visual styles (Liao et al. 2017) between photographs. The first technique called StyleBank allows users to transfer an artistic style from one image to another. A user can, for example, transfer the style of impressionism to a photograph of an old house. The second technique named deep image analogy can search for similar visual content or perceptually similar semantic structures between photographs and swap them. A user can, for example, swap a face of Leodardo's Mona Lisa with a face of a character from the Avatar film. Another AI-based technique is called the neural talking head, which utilises AI to animate still images and make people on them talk (Zakharov et al. 2019). These are just a few such examples, but several others exist.

Coupling such technologies with AR provides an opportunity to create a medium with rich and numerous possibilities to support remixing or mashing-up various styles and elements in all sorts of ways.

18.3 Discussion

Game-like activities in art education, such as the one described above in Sect. 18.2.2 Playing with the Artworks, can contribute to a richer, educational and entertaining experience. The idea of mixing learning with play and technology is not new (Brosterman 1997). In 1837, Friedrich Froebel came up with an idea to teach children the concepts of numbers, size, shapes and colours with toys developed specifically for this purpose. Recently, studies have shown that children quickly learn how to express themselves creatively with new technologies (Resnick et al. 1999). And there are several examples on how technology enhances creativity through playful explorations instead of serving passive consumption only—a too often perceived role of technology (Resnick 2006).

18.3.1 User Engagement Continuum

AR provides an ideal platform for engaging with artworks in a playful, entertaining and educational way as described by examples in previous sections. It allows for leaving digital augmentations of physical artworks and exhibitions while preserving their physical integrity. The extent of engagement can vary from passive consumption to active creation that present two edges of the user engagement continuum. The user engagement continuum can be used in several contexts. In this chapter, we use it to portray the possibilities of engaging users with art through AR. We placed several

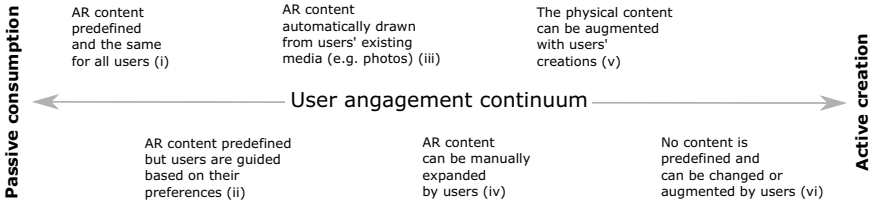

Fig. 18.10 User engagement continuum with some examples of potential AR usage in museums and galleries

examples of possible AR applications on the continuum based on how engaged users are when interacting with artworks and/or their environment using AR applications (see Fig. 18.10).

These examples are described in more detail below. The bullets, while being numbered, are not exclusive, and other examples can be inserted within. Moreover, the order selected is from *User engagement none (passive consumption)* to *User engagement high (active creation).*

i. The physical and AR content are predefined (curated by professional curators) and the same for all users. Despite using AR to augment artworks and provide additional information about it, the AR content is still intended for passive consumption only.
ii. The physical and AR content are predefined, but the AR application adapts to user's preferences (e.g. available time, personal interests, previous activities). An example is an AR application guiding users through an exhibition in a personalised way.
iii. The physical content is not completely predefined, and it automatically draws additional content presented in AR mode from users' media library (e.g. existing creations). An example of such a solution would be an application that would place user's photographs among other physical photographs in the exhibition.
iv. The content is predefined but can be manually expanded by users. An example is *TARX* (see Sect. 18.2.3) that allows users to add their own content to an existing predefined collection. This content is curated by curators and made visible to all other users.
v. The content is predefined, but users can augment it in their own personalised ways. An example of this application is *Playing with the Artworks* (see Sect. 18.2.2) where users can personalise, build upon and change existing physical artworks in the digital domain. Another example is *I was here* application for creating digital graffiti (see Sect. 18.2.4). However, this level could also involve commenting on artworks, leaving thoughts about artworks for future visitors, etc.

vi. The content is not predefined and can be changed by users. An example of this would be enabling users to curate their own exhibition with existing and/or own/augmented creations. An example can be a crowdsourced exhibition that can dynamically change based on visitors' augmentations and input (e.g. voting).

We do not argue that any of these examples is better than the other. The list presents some possibilities, and it is up to the curators to decide what benefits could AR bring to the table based on the intent of the actual exhibition. Parallels can be drawn from the media world, for example, that has been massively reshaped in the past decades. The digitisation of media has fundamentally changed the way the media is produced, distributed and nonetheless consumed. With it, the relationship between producers and consumers has changed as well (Sparviero 2019). The latter have been given a choice of consuming media when and where they please and have become active participants in rating, commenting, sharing, promoting and nonetheless adapting the media consumed—any video, music or photograph can be subjected to endless reinterpretations by users versatile with the right software. Art exhibitions have a similar potential with AR to change the way we consume art as well as the relationship between viewers and curators.

18.3.2 Copyright Issues

There are several issues that arise with allowing users to augment artworks. For once, building upon other artists' work can cause conflict in terms of copyright infringement. As have been discussed (Coulton et al. 2014a, b), galleries, museums and artists often rely on laws relating to publication and copyright that were established for physical artefacts and struggle to adapt to the implications of the digitisation of their content. What is seen as archaic in the digital world is still a norm in creative industries. Any AR application intending to use or allow to build upon digital representations of copyrighted material must take these conditions into account if the application is to be used outside a purely research context. Note that while the following discussion is related to UK law, it is important that developers of such applications consider the corresponding laws of the countries within which they may wish to make the application available.

In the UK, copyright lasts for the lifetime of the artist and is transferred to their heirs for 70 years after their death. When an artist sells their work to a collector, gallery or a museum, the copyright for that work does not transfer unless an explicit agreement is reached. In the EU, the extent of the copyright beyond the period of 70 years after the artist's death is automatically given to the person or body that publishes the work for the first time after the original copyright has expired. The meaning of 'publication' in this situation includes any communication to the public by : issuing copies of the work to the public; making the work available via an

electronic retrieval system; renting or lending copies of the work to the public; exhibiting or showing the work in public; and televising the work via broadcast, cable or satellite.

These laws directly affect galleries' or museums' ability to use artworks from their collection using AR as a specific permission had to be obtained for all the works featured in such application that were still subject to the copyright law. In terms of publication rights, things are potentially more complex in cases where copyright expires during the time period when the artworks are being used by an application. This dictates that museums, galleries and collectors should ensure that any applications created should be done through their own developer accounts.

While the above discussion indicates that artists are very well protected in relation to their work, the study by Coulton et al. showed that many still view the digitisation of their work with great suspicion (Coulton et al. 2014b). Despite the protection, one artist in particular insisted on an explicit statement in the application that the artwork must not be used outside the application (such as taking a selfie with the artwork and sharing it on social networking sites).

18.3.3 Curation of User-Generated Content

User-generated content (UGC), if it is to be viewed by the public, may present an issue as well. Contributing content to a curated collection, for example, might change the collection in an unacceptable way for the curator who put up such a collection with a particular purpose in mind. Another problem might present offensive messages with political, social, racial or other connotations. Also, showing inappropriate or sensitive content to any age groups can also be a potential problem. While museums, galleries, city councils or any such organisation in charge of a particular collection that supports users' augmentations would not be accountable for users' content, similar to how social media sites cannot be held accountable for content posted by their users (although they can remove it if it violates their terms) (Volpe 2019), these organisations will still most probably not wish to be associated with inappropriate and sensitive content.

As such, if an AR application enables user engagement in any way in which users can contribute their content, this would have to be subjected to verification, curation and filtration according to terms of service. On the other hand, any curation limits the expressivity of users and needs to be carried out in appropriate ways. Explaining to users what is acceptable and what is not upfront might avoid any potential issues with users creating and sharing sensitive or inappropriate material.

There are several ways to moderate user-generated content. Simple approaches include registering users, restricting content creation to only organised groups of tourists or restricting the content creation from dedicated locally placed devices (which would eliminate the need of public Internet access, app installation, using one's own device, and would simplify moderation). One possible way would be to engage the public to up- or down-vote UGC, which would also mean that the public

would see such content. Another possible approach is to manually verifying UGC by employees who work for the exhibitor of a collection. This might inevitably present additional costs. However, it would enable users to express their creativity in a safe and playful environment.

18.3.4 Other Implications

There are several issues that we have already mentioned above. For example, (Coulton et al. 2014a, b) the researchers mention that participants in the study ended up engaging with digital representations of art instead of physical gallery content. These findings have been confirmed in other studies as well (Chang et al. 2014; Kljun et al. 2019). This is an often-underexplored issue when technology is used in a context that predates it. It has been shown, for example, that users engage more with the physical form of art if the content is digitally augmented and not duplicated (Kljun et al. 2019). But this also depends on the form of art. One of the techniques used to reduce the engagement with technology is to enable the AR content only when needed. For example, on the educational trail, the AR application is unusable unless users reach a particular location (utilising location-based services as, for example, in TARX presented in Sect. 18.2.3). In such a location, the phone starts vibrating to inform users that AR content related to cultural and natural heritage of that site can be observed there (Kolar et al. 2019). If not located in one of the predefined locations, the dedicated application is unusable, and users can have their phones in their pocket.

Other issues mentioned in the literature are the social acceptability of technology and its effects on the engagement between collocated visitors (tom Dieck et al. 2018). Sometimes, acceptability can be attributed to the form factor of technology used. For example, HMDs are commonly not socially accepted when other people are present (Schwind et al. 2018) since HMDs affect face to face communication and can isolate its user. Handheld AR mobile devices are more socially acceptable as reported in Chang et al. 2014; Šimer et al. 2016. Bystanders are not bothered if someone is pointing a phone towards an object of interest. Nevertheless, these devices also affect communication between collocated visitors and can turn the focus on technology instead of art. In the aforementioned study (tom Dieck et al. 2018), users wore AR glasses, but despite being less noticeable compared to full size HMDs, were also socially not accepted. This can be attributed to privacy and security concerns as well as cultural factors. Similar to how society changed its attitude towards mobile phones with their diffusion (e.g. two decades ago answering a mobile phone in a restaurant during a meal was still unacceptable), AR glasses could become more acceptable in future.

AI-driven personalisation of digital media has wider societal implications as well. Ignatidou (2019) frames AI creation and modification of digital media in the context of human rights, societal resilience, as well as political security, and notes that ‘data protection, privacy and wrongful discrimination, as well as freedom of opinion and

of expression, are some of the areas impacted by this technological transformation'. She also mentions the need for domain- and context-specific codes of ethics and the need for publishers to fit their editorial codes to the new reality. However, these topics go beyond the scope of this chapter and the reader can read the mentioned report and associated references for more information.

18.4 Conclusion

The role of art in humans' development is well known. Creating, contemplating and possessing art in all forms can spark users' exploration of their imagination (which in turn takes a tangible form) and playfulness and enhance entertainment—art is what makes us human (Scharfstein 2009). Engaging users with existing art and helping them to experience artworks in a different way has not been widely explored since we usually consume art in a passive way. AR presents an untapped potential for extending users' interaction with existing artworks within a mixed reality space.

In this chapter, we present examples of AR applications that allow users to engage in different ways and formats with the exhibited artworks. We then present the *user engagement continuum* that spans from *passive consumption* to *active creation.* The user engagement continuum is not limited to AR, but we used it to encompass and establish the relationship between presented AR applications intended to be used in museums, galleries, towns based on the amount of creativity each of these applications supports. They can incorporate tools to enable users to remix existing artworks and/or exhibitions—this is to change, adapt, modify, personify and personalise physical artefacts and/or space by digitally augmenting it. While the artistic merits of the majority of such mashups will not rank high, the process itself supports users in active engagement with art and in expressing their creativity in ways not possible with other technologies.

We also touch on the topics of the copyright issues, curation of digital content created by visitors, social acceptance and design implications. These are important topics for designers of such AR applications to consider in addition to practical uses within a selected environment.

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Chapter 19
Rhythms in Stone: Revealing and Augmenting the Human Presence in Mesolithic Rock Art

Dragoş Gheorghiu, Livia Ştefan, Mihaela Moţăianu, and Geir Harald Samuelsen

19.1 Introduction

In the Fontainebleau Forest near Paris, there are more than 500 limestone formations in the form of large boulders (Fig. 19.1), which contain caves and shelters, all with walls covered by incised straight lines or various geometric or iconic images (Fig. 19.2).

The origins of these incisions date from the Palaeolithic (Thiry et al. 2020) until the post-medieval period, a good part of them being identified as belonging to the Mesolithic (Guéret and Bénard 2017) and being dated approximately 11,500 BP to 7000 BP. Currently, a group of archaeologists coordinated by Professor Boris Valentin[1] continues to conduct research in the rock art complex at Fontainebleau, a process which began decades ago.

The image produced by the incised lines, the result of an enormous number of human gestures fixed in stone, has a strong artistic effect and consequently aroused the interest of visual artists (Fig. 19.3).

Thus, in 2019, the visual artist Geir Harald Samuelsen of the University of Bergen initiated a project designed to reveal this art to the public. The "Gestures, Matter and

[1] https://news.cnrs.fr/articles/the-forest-of-fontainebleau-is-home-to-rock-art-treasures.

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Fig. 19.1 Limestone boulder in Fontainebleau forest. Photograph by G. H. Samuelsen

Fig. 19.2 Decorated cave with Mesolithic incisions. Photograph by G. H. Samuelsen

Fig. 19.3 Detail of the Mesolithic incised lines. Photograph by G. H. Samuelsen

Soul" project, in which three of this paper's authors participate, is ongoing, and it involves both visual artists and archaeologists.

The present work also attempts to reveal to the public the prehistoric incisions from Fontainebleau through a method that provides the user with virtual access to the site and, specifically, to the technology of making incised patterns, by using AR technology on a phone.

To this end, the work presents an AR application created for this purpose for Android devices, which allows visitors to the Fontainebleau site (either in person or online) an augmented experience of prehistoric art. The application is called "Fontainebleau CaveARt", was developed with the Wikitude AR framework (SDK)[2] for JavaScript and has a marked educational character.

Consequently, the text represents a mixed work blending archaeology, visual art and IT, while the proposed AR application is intended to be an instrument of an archaeology of performance (see Inomata and Coben 2006).

19.2 An Archaeology of Performance

From the perspective of recent studies (Azéma and Rivère 2012; Lorblanchet 2010; Hodgson 2008; Ruiz-Redondo et al. 2020), all prehistoric parietal art is the result of a complex cognitive activity, including the simultaneous use of light, colour and sound

[2] https://www.wikitude.com/products/wikitude-sdk/ [accessed on October 2021].

(Gheorghiu 2019; 2020; 2021). Experiments conducted on the production of colour spots on cave walls from the Palaeolithic have shown the existence of a synaesthetic agency of the performer, the art produced being the result of a combined kinaesthetic, sound and visual intervention (see Gheorghiu 2019; 2021).

The special context of caves, which favours the generation of Altered States of Consciousness (ASC) due to poor ventilation and lack of light (Medina-Alcaide et al. 2021; Beaune 2000), played an immense role in the immersion process of the prehistoric performers. All these conditions for the creation of parietal art were considered to be of a shamanic nature (Clottes and Lewis-Williams 1998), and therefore, the complexity of such an art produced by synaesthetic action cannot be described only by means of a textual account, but requires a detailed visual support. It requires performance.

Currently, archaeology is aware of the limits of re-presentation (see Bonde and Houston 2013), a fact which has led to the development of experimental and even experiential archaeology (Hansen 2014), in which attention is focused on the phenomenological experience of the performer (Gheorghiu 2011).

19.3 Experience of the Prehistoric Ritual Art

The site chosen for the performance of making incised lines similar to those of Fontainebleau was a cave in a limestone quarry near Buzau, in eastern Romania. The main purpose of the performance was to experiment and then to highlight the rhythmic action of drawing incised lines.

The rhythmicity of the incision action gave it a ritual character, by standardizing the gestures of drawing and even those of providing light.

Rhythmicity was also facilitated by the geometric simplicity of the patterns to be reproduced, respectively sets of parallel lines, sometimes superimposed at an angle of 90° by other sets of parallel lines, which indicates an interruption of the initial rhythm followed by a resumption of it with other gestures.

For performing the incisions, the tools used were flint blades, as in Fontainebleau (see Guéret and Bénard 2017), and a bone spatula, while the lighting was done with a piece of wood soaked in animal fat (Fig. 19.4). In the end, the set of parallel lines could be perceived as a diagram of the rhythmic–ritual action of the performer, and from this perspective, an attempt was made to explain to the public the prehistoric incisions of Fontainebleau.

Fig. 19.4 A performance showing the engraving of a cave wall. Video stills by M. Moţăianu

19.4 Augmented Reality as a Solution for Explaining the Prehistoric Art

In order to solve some of the representation problems linked to the performance of recreating the prehistoric parietal art, the authors called upon the benefits provided by augmenting the information in an application designed to work on mobile devices.

AR is currently used in archaeology to reconstruct objects (Martínez et al. 2018; Hannah et al. 2019), as well as historic (Saggio and Borra 2011; Westin and Almevik 2017; Battini 2015) or prehistoric environments (https://artsandculture.google.com/project/chauvet-cave).

Unlike these examples, the proposed application uses the fractal principle of immersion in the subject (Gheorghiu and Ştefan 2014; 2018), starting from the macroscale of the geographical site to the microscale of performance and created art.

Such an approach has two advantages. First of all, the geographical context of the Fontainebleau rock engravings can be presented and thus the user of the application will be able to access the site regardless of their distance from it. Secondly, the process of creating incised patterns can be presented in the context and thus the entire performance of rhythmic body movement of tracing and lighting can be followed. Thus, the user can more closely approach the creator's experience than would be allowed by a static visual representation and a text. Both attributes of the application

have a pronounced educational character because together they allow both a display of prehistoric art in the geographical context and a description of it as the result of a performance.

Augmented reality (AR) provides a complex form of visualization that aims to enhance the information associated with objects in the environment or with the environment itself. Together with virtual reality (VR), they are referred to as extended reality (XR) in Educause Reports (2020, p. 29) and defined as "a comprehensive term for environments that either blend the physical with the virtual or provide fully immersive virtual experiences". This feature was decisive in choosing AR as the method and technology to allow immersive experiences in the context.

In typical AR projects, which use current consumer mobile devices, the digital content that overlaps with the information from the physical reality is represented by texts, images, videos or 3D objects. Most digital assets are used as augmentations, which address the visual senses.

Other advanced augmented reality projects, which also use specialized hardware devices to create a mixed reality (Azuma et al. 2001), can introduce augmentations with stronger sensory impact or combinations of augmentations (Pedersen et al. 2017). This type of complex augmentations, which address a higher cognitive level, has been considered in the present research, to explain the synaesthesia of prehistoric art.

Compared to other related technologies, the experience offered to the user by AR technology is essentially special, because the user is at the same time placed in the real context as well as in the digitally recreated one. This type of immersion enriches reality through a synergy of information, giving AR an important pedagogical potential.

19.5 AR in Archaeology

The AR characteristics presented above have made the technology a tool used in archaeological research, heritage projects, cultural, museums, archives, cultural heritage sites or as creative tools (Efrat 2021; Gheorghiu et al. 2021; Lichty 2018; Gheorghiu and Ştefan 2016, 2018, 2019).

AR in archaeology is used to interpret and verify scientific hypotheses "in real context and on a just-in-time basis" (Trapp et al. 2012; Papagiannakis and Magnenat-Thalmann 2007), but especially in promoting the past to the public.

The archaeologists leverage the affordances of the AR such as computer-based reconstruction to align with archaeology's specific phenomenology, such as embodied experience in the field (Eve 2012, 2014). An early utilization of AR and virtual re-enactments in an archaeological research project is represented by "Archeoguide" (Vlahakis et al. 2002), which was intended to create an electronic touristic guide, both indoor and outdoor, of the archaeological site of Olympia in Greece, where the AR experience is based on dramatic stories and virtual historical characters.

AR can be used for restoration and/or reconstruction purposes, by immersion in the historical context. This type of immersion that enriches reality through various information gives AR an important pedagogical potential, which has been widely exploited both in research (Gheorghiu and Ştefan 2012, 2016; Shafer 2018) and in academia (Hannah et al. 2019).

Location-based AR scenarios have resulted in many and very popular implementations, in domains such as heritage and archaeology (Gheorghiu and Ştefan 2012, 2014, 2015, 2016, 2018, 2019; Azuma 2015).

One such example could be that of an AR application designed as an educational tool able to alert and inform people on endangered archaeological sites and make them more aware of the impact of different factors such as human or natural action (Gheorghiu et al. 2020).

19.6 The Educational and Creative Value of the AR Applications

All AR projects dedicated to archaeology include an educational aspect, even if this is not explicitly stated. Although initially defined as VR technology-based (Ferdani et al. 2016; Barceló et al. 2000) research methods in archaeology (Niccolucci 2002; Forte and Siliotti 1997), virtual archaeology and digital archaeology have also adopted over time AR (Pescarin 2014) for museums and tourism.

AR applications encourage experiential and contextual learning, and can be applied in both formal and informal education. Although the use of these technologies can "scale up" the learning costs (Educause 2020, p. 30), on the other hand, it encourages creative learning and "offers learners the rich learning experience of co-creating course content" (Educause 2020, p. 30) and "innovative pedagogies" (Martínez et al. 2018).

In Pedersen et al. (2017), the authors demonstrate how the visual augmented reality experience can be used to aesthetically enhance museum exhibits, galleries and cultural heritage sites and thus become an educational tool of cultural tourism.

Berlino et al. (2020) consider cultural tourism to be one of the main activities for the enhancement of archaeological heritage visibility. Information and communications technologies are used to provide visitors of the archaeological park of Castiglione di Paludi with specific and complete information about tangible culture by means of a mobile application under the form of 3D models attached to several points of interest. The application proposed is part of the same educational perspective of promoting cultural tourism.

Fig. 19.5 AR application "Fontainebleau CaveARt". Photograph by M. Moţăianu

19.7 Description of the AR Application

Taking into account all the features of parietal prehistoric art and educational AR applications, an AR application for Android devices is proposed, called "Fontainebleau CaveARt", which allows an in-person or online visitor an augmented experience of Mesolithic art (Fig. 19.5).

The AR experience was designed so that the user can progressively go through the following levels of detail of The Elephant Rock in a "fractal" way: the geological context, prehistoric art and the techniques of creating this art.

To present the context, a custom Google Maps map was created called "Fontainebleau Forest Rock Art" (Fig. 19.6), centred around the place where one of the limestone formations specific to the Fontainebleau site is located, called The Elephant Rock (Fr. Le Rocher de l'Éléphant), which is very close to the Larchant village[3] (Fig. 19.7).

An image of The Elephant Rock was uploaded to the POI (Fig. 19.8). The Elephant Rock can be considered an archetype of limestone formations inside which there is a cave with walls covered with incisions mostly dating from the Mesolithic.

This digital map can be explored by the user to determine the location and understand the geographical environment of the prehistoric site.

[3] https://www.onf.fr/onf/+/a21::lonf-securise-le-rocher-de-lelephant-en-foret-de-la-commanderie.html.

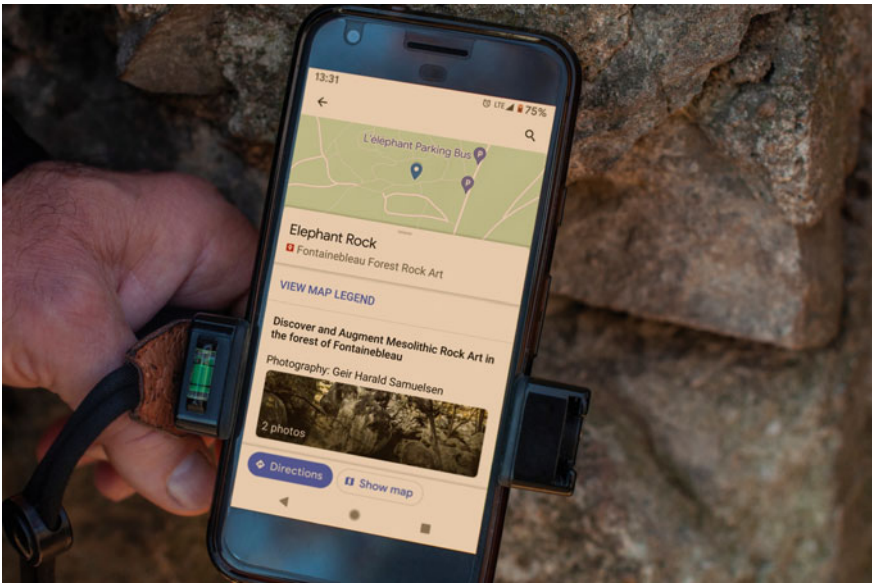

Fig. 19.6 Custom Google Maps map "Fontainebleau Forest Rock Art". Photograph by M. Moţăianu

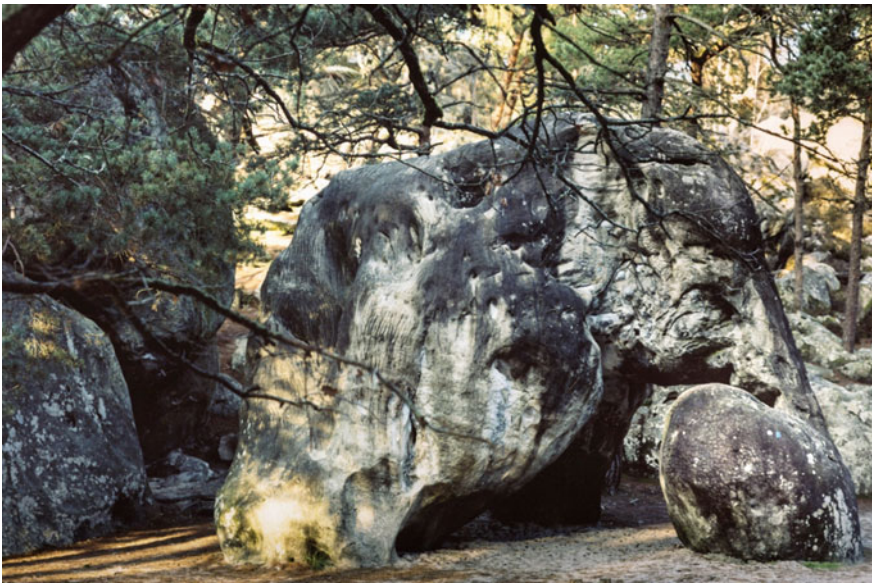

Fig. 19.7 The Elephant Rock, Fontainebleau forest. Photograph by G. H. Samuelsen

Fig. 19.8 Image of The Elephant Rock as the AR target. Photograph by M. Moţăianu

To initiate the application, a special image recognition AR process is used. The Elephant Rock image associated with a POI will be used as a target for image recognition, and thus, the augmentations will be visible only through the user's interaction, respectively, by touching the right-sided image buttons. The buttons will be visible in AR view only after the image recognition has taken place.

This solution, based on user interaction, has the role of creating a fractal AR immersion experience, from macro- to micro-scales, respectively, from the image of the site to that of a cave interior. The first button determines the display of an image-type augmentation, representing the first level of fractal detail, respectively the interior of the cave with incised walls (Fig. 19.9).

The second button determines the display of the second image-type augmentation, representing the second level of fractal detail, respectively an enlarged image of the rhythmic incisions on the cave walls (Fig. 19.10). The image is smaller than the first and overlaps the first. The user can reposition it by dragging it on the surface of the screen, so as to keep both in the field of view.

The third level of fractal detail is that of kinaesthetic action or performance, for the presentation of which the third button will be used, which determines the release of a video film as an augmentation of the previous information (Fig. 19.11). The video film presents a performance made by D. Gheorghiu and recorded by M. Moţăianu, displaying the incision and lighting actions.

To allow the user to resume and repeat the entire AR experience, two additional buttons were created, one for removing the augmentations and the repeating of the fractal cycle, and one to allow for screen captures that could subsequently be shared.

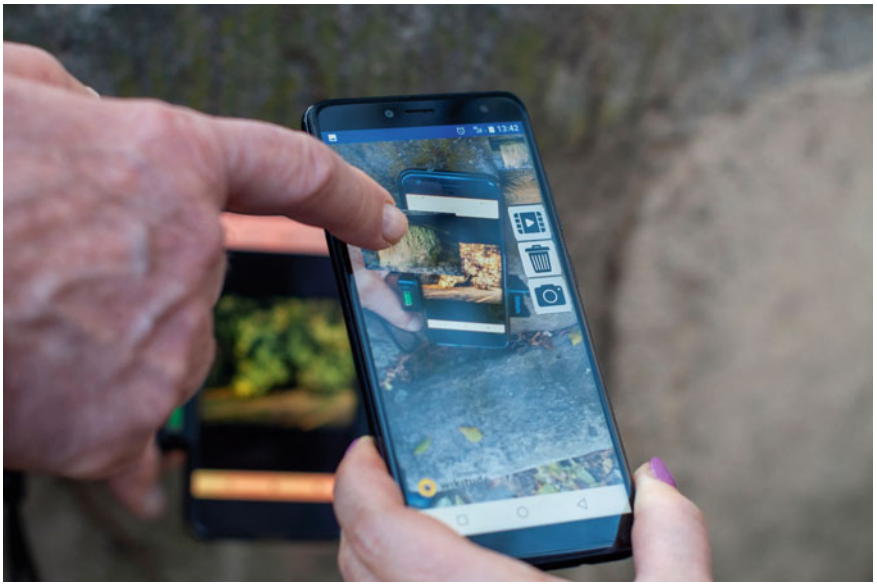

Fig. 19.9 Screen of the AR application with the first-level augmentation. Photograph by M Moţăianu

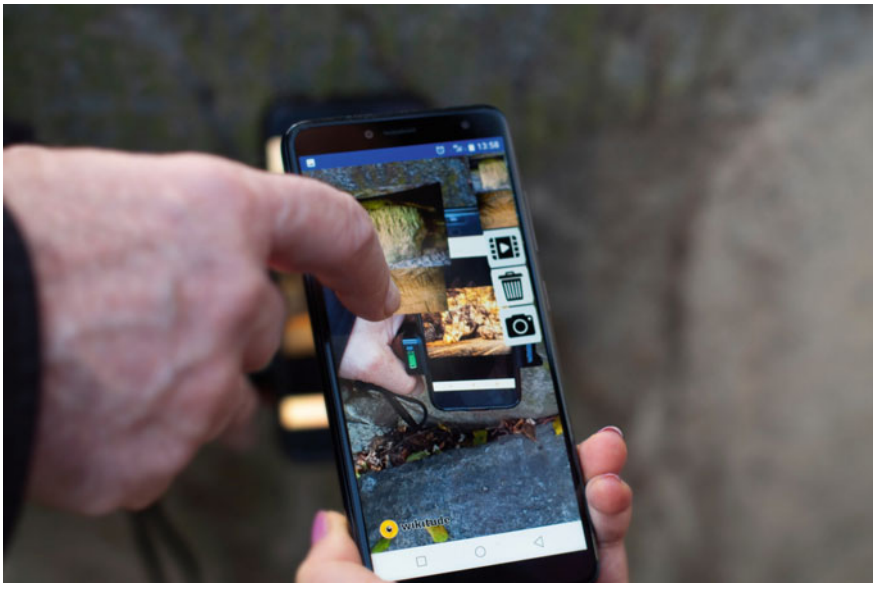

Fig. 19.10 Screen of the AR application with the second-level augmentation. Photograph by M. Moţăianu

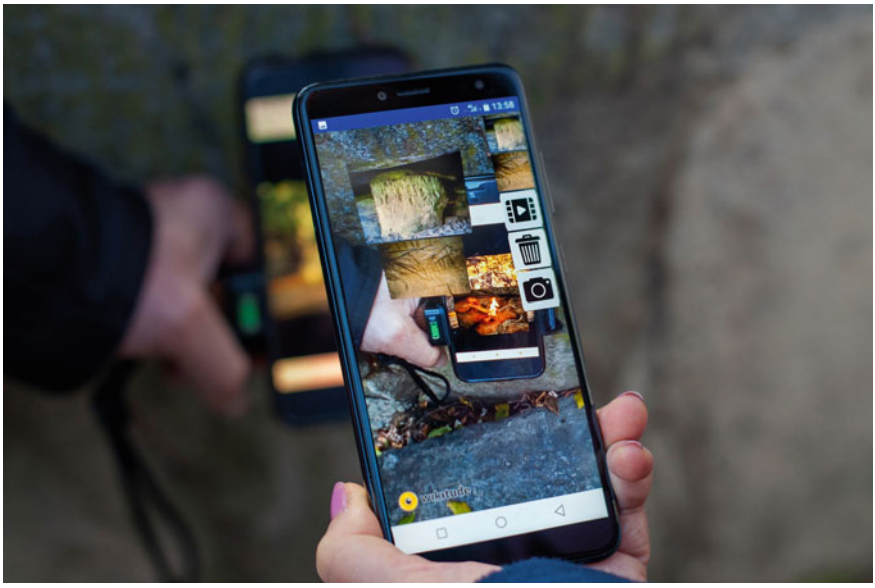

Fig. 19.11 Screen of the AR application with all augmentations—two images and the performance video. Photograph by M. Moţăianu

For the proposed AR experience, the Wikitude AR SDK for JavaScript[4] and a custom Google Maps map were taken into consideration. The resulted application implements a combination of advanced AR-associated techniques, such as geographic location detection, image recognition, motion tracking, video snapping and gesture-based interactions.

Motion tracking is the fundamental AR process, its purpose being to correctly position the augmentation within the user's surrounding space while the user is moving the camera (Azuma 1997; Ştefan 2011).

For the third AR experience, a special motion-tracking feature supported by Wikitude was implemented, called video snapping; i.e. the video attached to a visual element of the camera will continue to run in a loop, after the image target will disappear from the camera.

The motion-tracking process is controlled by the Wikitude AR framework (SDK), while the application interface is developed in Android, using the Android Studio Arctic Fox[5] version, as the integrated development environment.

[4] https://www.wikitude.com/products/wikitude-sdk/ [accessed on October 2021].

[5] https://android-developers.googleblog.com/2021/07/android-studio-arctic-fox-202031-stable.html. [accessed on August 2021].

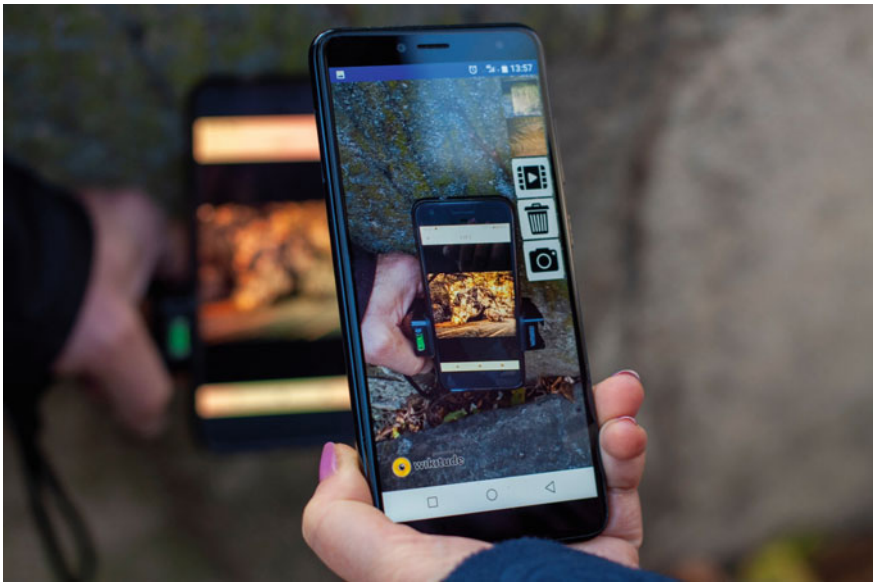

Fig. 19.12 The image associated with the POI is scanned with a second phone. Photograph by M. Moţăianu

The AR application was tested on two Android devices, one V3 Viper Allview[6] with Android 8 ("Oreo")[7] and one Samsung Galaxy A12 with Android 10 ("Q").[8] The version Android 6.0 ("Marshmallow")[9] was set to be the minimum target platform, so that the application would also be accessible using older smartphones.

When designing the application and the AR experience, the case in which the user is not physically present in the Fontainebleau Forest was also considered. In this scenario, the user will open from a workstation the custom Google Maps map called "Fontainebleau Forest Rock Art",[10] centred on a static (pre-defined) POI that marks the area where The Elephant Rock is located. The user will open the AR application from a mobile phone, from which she/he will scan the image associated with this static POI, thus participating in the AR experience described above.

If the user is on the site in person, she/he will open the AR application which will display her/his location on a Google Maps map centred around the user's location, and which will display on a dynamic POI the user's distance from the location of interest, i.e. The Elephant Rock boulder. With a second phone, the image associated with that POI will be scanned to participate in the AR experience (Fig. 19.12).

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[6] https://www.allview.ro/v3-viper.html [accessed on October 2021].

[7] https://www.android.com/results/?q=versions [accessed on October 2021].

[8] https://www.android.com/results/?q=versions [accessed on October 2021].

[9] https://www.android.com/results/?q=versions [accessed on October 2021].

[10] https://www.google.com/maps/d/u/0/viewer?mid=1ylSP_5HvL-P6NvVXajb_PhX5xBesGE5d&ll=48.29374028687085%2C2.594290710009153&z=17.

19.8 Results

The advantages of transmitting complex information with an educational role through an AR application were tested with students from the National University of Arts in Bucharest.

In the first phase, the method used was explained to them, respectively fractal AR approaches (Gheorghiu and Ştefan 2014, 2018), and its scientific advantage.

The discussions that followed the presentation of the operation of the application were mostly about the way to perceive prehistoric art as a dynamic, performative and ritual phenomenon. After presenting the application, the students perceived the parietal incisions as diagrams of gestures, similar to their own gestures, thus bridging the historical time gap.

19.9 Conclusions

Information augmentation is a process with cognitive and educational values, and its use in the cultural field proves its efficiency. The ultimate goal of any AR application is to create an immersive environment that connects the real world to the information with which it is augmented.

One method to facilitate the immersion, proposed by two of the authors, is that of fractal augmentation (Gheorghiu and Ştefan 2018), in which each new augmentation reveals details of the previous one, like a fractal. In this paper, the method was applied to link the physical context of the site with that of the production of prehistoric art. It started with the presentation of the context, then of the details of the context, followed by the presentation of the performative act in the context.

If in the first two augmentations the images were static, in the third, which highlighted the rhythmicity of the ritual gesture, a video was used of the performance of the incision of some lines with flint tools.

The AR application has been designed so that the fractal concept can be translated into the AR experience created by the user. For this, the following elements were creatively combined: two traditional AR methods of triggering augmentations, location-based and image recognition; three augmentations with images and video, superimposed on the same scanned image (target); and user intervention in the sequence of augmentations, the result being a complex, participatory AR experience.

The educational role of the application was verified when the application was tested in the presence of students from the National University of Arts in Bucharest. The discussions contributed to a more nuanced understanding of prehistoric art through the example of Fontainebleau. In this way, the application was verified from the point of view of its educational efficiency.

The application has shown that it can reveal the human presence behind an artistic–ritual achievement, even if we are separated from it by over ten millennia.

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Chapter 20
Augmenting Wilderness: Points of Interest in Pre-connected Worlds

Nathan Shafer

20.1 Introduction

This is the third edition of the chapter on augmented reality artmaking. A few of the methods of AR artmaking have become obsolete, and some of the formalities for terminilogy have changed: internet is no longer capitalized, Mt McKinley is no longer used to refer to Denali and the junaio mobile AR app was bought by Apple and everything on that platform was taken offline. Layar and hp Reveal are also gone.

Figure 20.1 was the QR code for this chapter, which launched a channel called "Augmenting Wilderness" when scanned using the Junaio mobile AR application, so that the reader could hear some of the audio tracks embedded in this essay, or follow some links to cited works. This chapter also made the same work available on an identical channel, on the Layar mobile app. These augments are either no longer available due to cost and technological availability.

Augmented reality art began gaining common relevance by recuperating into this type of commercially viable interactive print, which is based on targets instead of geolocation. It is easier to monetize and advertise with. AR in contemporary usage, however, remains an intrinsically global and viscous practice, whether it is functioning in this sort of consumerist enterprise or if it is a radical intervention of everyday life.

This chapter is going to look at a few projects that have constructed AR works in the worldwide public sphere—works steeped in the anti-tradition, practicing a flat ontology and presented on the borders of an increasingly connected world. They are unseen hubs in a worldwide social network; temporally localized, globally mobile—multiplicitous points of interest in the wilderness.

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https://doi.org/10.1007/978-3-030-96863-2_20

Fig. 20.1 Archived QR code for "Augmenting Wilderness," originally made for the junaio AR app (no longer functional)

I am Sitting in a Room was produced in 1969, one of the earliest compositions to incorporate electromagnectic tape and feedback (Fig. 20.2). The piece takes Lucier's recorded voice and records the playback of it in a room, where the room itself restructures the work into ambient static, ultimately getting rid of Lucier's stutter and creating a resonant frequency.

Today Lucier's work is an early representation of the way artists can intertwine digital media and physical location to develop mobile augmentations in the world. "Room" is a global work that can be accessed or recreated anywhere one takes recording equipment. When it was originally conceived, it came with a set of instructions on how to recreate the work hyperlocally, in one's own room. Participants started with the original recording of Lucier speaking and played it in a room, rerecording it, over and over until it becomes ambient static, shaped by the space they are temporally in.

20.2 AR, OOO

Augmenting wilderness is a practice in augmented reality art making—the process of enmeshing digital objects with pre-connected worlds. *Pre-connection* references the absence of wireless fidelity (Wi-Fi) within an ecosystem or community, but not the effects of it, which are evident in its local manifestations and are ubiquitous in the augmented object's realm of attraction. Pre-connection precludes the idea that eventually the entire world will be universally connected to the Internet, so it is a temporal descriptor, albeit based on a very optimistic prediction about the future

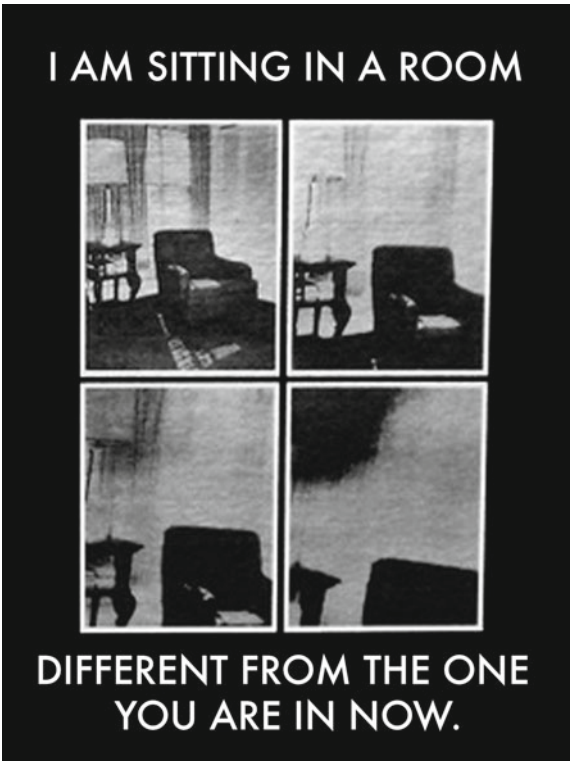

Fig. 20.2 I am sitting in a room by Alvin Lucier (1969), audio, 15:23. All rights courtesy of the artist, *image source* Nathan Shafer in the Creative Commons

of technological ubiquity. Pre-connection is going to be a contemporary, temporal condition of some areas on the planet, where either a lack of human population or environmental factors, keep the space signal from integrating with the local media ecosystem via ambient radio waves (Wi-Fi). Radio waves, satellite signals, and space weather are part of the nonlocal intermedia landscape of human mobility from global to interplanetary but presently are Anakin to the *social wilderness*, a wilderness completely outside of human construct or perception.

The use of the term *wilderness* in relation to AR adopts Levi Bryant's *wilderness onticology*, "(it) should not be conceived as the absence of humans, but rather in terms of a flat plane of being where humans are among beings without any unilateral, overdetermining role… humans dwell in wilderness without the wilderness being reduced to a correlate of thought," (Bryant 2011) looking at the wilderness as a multiplicitous "difference engine," in the context of object-oriented ontology (OOO), an aesthetic philosophy of being that takes the perceived reality of objects out of Kant's *Copernican Revolution*, which predicates the existence of objects on the human-world correlate of them (Kant 1781). Defining wilderness, for the sake of augmented reality as an artistic practice, is more a discussion than definition, as

Oeschlaeger notes, "the issue involves the *theorie* upon which *praxis* will rest—the idea of wilderness itself. Whatever this idea, the conceptual difference will be reflected in practice" (Oeschlaeger 1991).

Certain theoretical aspects of augmented reality artistic collectivism are ecologically parallel to OOO, especially the metaphysical nature of the AR "art-object," which focuses "on the informational relationship between object and human viewer, or the political and economical context surrounding the artwork's reception" (Jackson 2011). OOO emerged at around the same time as mobile AR collectivism (2009–2010), so it is no surprise that there are similarities due to their temporal proximity: there are issues of critical reception for both groups because of their incorporation of non-traditional platforms like social networks and blogging—both groups are also academically suspect in many circles, (OOO is unconcerned with the Analytic vs. Continental beef, and AR is equally unconcerned with Modernism vs. Post-Modernism).

Early critical issues concerning augmented reality as an emergent art form are described as the "antiquated VR pipe dreams" via the new media blog, Rhizome.org, taken from fictional depictions of AR and the use of the "Web browser" as an artistic metaphor. The "VR pipe dreams," which William Gibson fictionalized in his 2007 novel *Spook Country*, as "cartographic attributes of the invisible," or "spatially tagged hypermedia," (Gibson 2007) are what viewers are truly expecting to see when they first experience AR. Augmented wilderness, then, is a good place as any to examine the basic instability of contemporary AR, in contrast to a virtual fantasy world overlaid on top of our collective expectations of it as an artistic medium. AR is a "specialized" sub-set of the global media ecosystem, what Ian Bogost describes as a *microhabitat* (in terms of media ecology) with the value of the specialized media being "less important than the documentation of its variety and application" (Bogost 2011). Like the health of a biological habitat—media ecologies measure their health in variety and application.

20.3 POIs

Singular augmented reality pieces, commonly referred to as points of interest (POIs), are augmented objects in a world of other equivalent objects, where humans are just one group of beings. Like other objects, or works of art, these POIs are not existentially contingent on human cognition—their being and their properties are different things. T. S. Elliott's *objective correlate* is viable for many artists working in the modernist or postmodernist traditions, but it is inconsequential when discussing the formal characteristics of AR artworks without their existences sharing an equal ontological footing with their properties or physical attributes. The function of juxtaposing AR and OOO is not to elucidate or explain formalist aesthetic philosophies, or to open a critical inquiry into any particular works given status as art, object/subject, or object/thing but to illustrate how augmented reality art performs, when looked at in a flat ontology, in spite of Kant's correlate, a dated, homocentric view of the universe

that is counter-intuitive to our current worldview, where kids grow up knowing that things happen on exoplanets, like Gliese 436 b, a water planet the size of Neptune covered with "hot ice" (Gillon et al. 2007). Or that there are diamond volcanoes on hot carbon planets that have surface landscapes of duning pencil lead (Clark 2012). These amazing aspects of the literal wilderness in the known universe—do not need human observation to exist, we can guess at their existence mathematically or theoretically, but the literal local manifestations of the objects themselves, these difference engines, are fine without us being physically present and observing them, especially since the practice of our observation is changing.

By now, the thing of AR has become second nature to us—people wandering about; staring at the world through little glowing screens, looking for POIs—is commonplace, even treated with speculative disdain by an older generation, who see smart phones as brain-eating mobile pacifiers, working to devolve our sapience. As a process, mobile media observes the human aesthetic experience, enmeshing objects in the world, what Timothy Morton, refers to as, the *aesthetic dimension.* "(It) is the causal dimension, which in turn means that it has the vast nonlocal mesh that floats "in front of" objects (ontologically, not "physically" in front of them)" (Morton 2013).

AR is an art medium, literally and physically operating in the nonlocal causal mesh Morton elucidates. At the present moment, AR has two different ways of being, or documented varieties: by attaching augments to a target (something that is scanned by a computer, generating an AR object, or POI), or by attaching augments to a geolocation (your computer knows where it is on Earth, which generates an AR object/POI). Currently, most developers and artists are using AR browsers, which are proprietary mobile applications for smart devices.

20.4 Radio Babies

Before looking at some specific AR art projects, which illustrate a flat ontology in the wilderness, Fig. 20.3 is an artwork by George Ahgupuk, called *Radio Babies* from 1940. It is ink and watercolor on bleached animal skin, with a stitched red sinew border. The image drawn on the skin depicts a fully clothed newborn flying from the bell horn of a radio, through the air, across the unseen ether all around us, to an Iñupiat family with a radio antenna at their cabin many miles away in Bethel. The white man at the bell horn is Joseph Romig, an early doctor in territorial Alaska. He would help aid in deliveries via radio, a proto-telephonic version of action at a distance. Early telemedicine. *Radio Babies* shows an immediate technological connection between remote locations (pre-connected worlds), and the way information exists in an ecosystem as part of the human experience inside of it. One of the notable elements of the work is Ahgupuk's ability to take a technological marvel (radio communication), being used for good (family medicine) and illustrate it with a pronounced bit of magical realism (the baby flying on radio waves) personifying nonlocal action via technology.

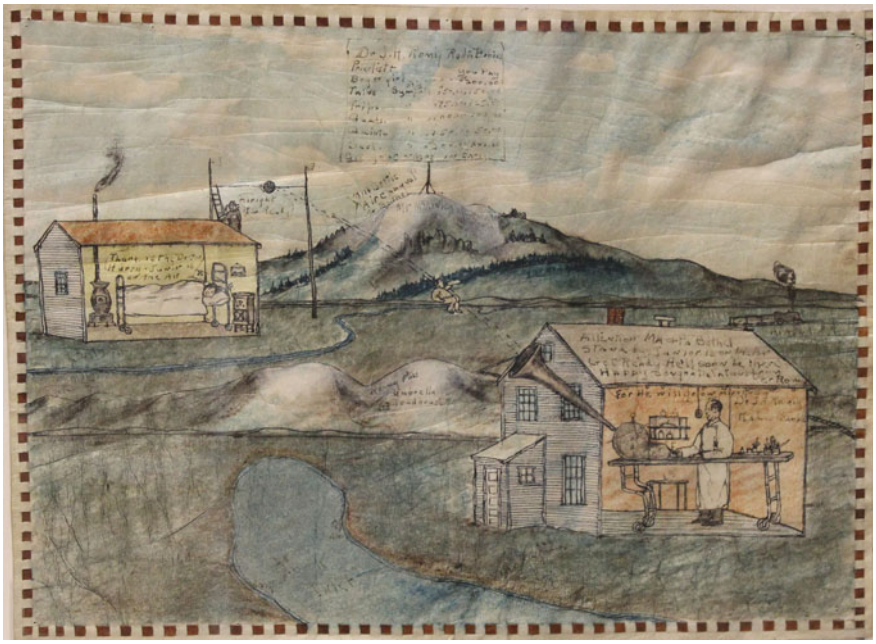

Fig. 20.3 Radio Babies by George Ahgupuk (1940), ink and watercolor on skin. *Photo* Anchorage Museum at the Rasmuson Center

Another poetic illustration of technology in *Radio Babies* is the gigantic see-through reel-to-reel screen on top of Denali in the background, titled the "J. H. Romig Radio Babies Pricelist," showing what people can expect to pay for family telemedicine services, boys and girls start out at $200, with discount prices for a twin, and notable discounts for triplets and quadruplets. Ahgupuk's written words in the painting are as much a part of the environment as the images of buildings and mountains, with the words "Umbrella Roadhouse" and "Rainy Pass" geolocated on their watercolor locations. *Radio Babies* practices a flat ontology where the ambient information in a place is equivalent to the other objects in it, without losing the complex humanness that is so apparent in the artistic depiction of the technology (the pricelist and the healthy family are both effected by the radio communicator). *Radio Babies* is a nonlocal networked media piece, made with locally available (and traditional) materials, which also places it firmly in the canon of Alaskan art history.

20.5 Anti-tradition

In 1996, when Nicholas Negroponte was looking at the future of digital media art from the beginnings of the MIT MediaLab, he wrote, "the digital superhighway will turn finished and unalterable art into a thing of the past. The number of mustaches given to

Mona Lisa is just child's play" (Negroponte 1996). He was mentioning Duchamp's *ready-mades* tangentially, but more importantly, he invoked a spirit many artists refer to as the *anti-tradition*, which has been part of the networked or digital aesthetic since its inception. The anti-tradition is not an art movement, but rather a variegated practice of producing counter-culture art, which has been going on for a very long time, from Bouzingo to Pussy Riot. The Canadian poet Christian Bök places the historical onus of the anti-tradition on the *'pataphysical* literature of Alfred Jarry (Bök 2002) whose major literary influence was the drunken dithyrambic fantasies of François Rabelais, a writer from the European Renaissance. Negroponte's enthusiasm for a society full of malleable cultural objects has been given a new technological tool for the anti-tradition with the advent of the "digital superhighway."

Regardless of when and where the anti-tradition emerged, its various practices and applications have usually aligned with revolutionary or countercultural political movements of the day—for example, members of the Situationist International were in the Latin Quarter during the 1968 riots in Paris and members of the Provo Group hijacked a balcony in the Vatican delivering an anti-religious Easter sermon before they were arrested. What is important to note is how works from the anti-tradition are quintessentially *of the time*, with each socially useful or relevant form these artists took to counter the dubious cultural dialectics of their time. As Gregory Sholette wrote, "If socially useful art is ultimately determined by the society it serves, the artist as tool maker must, by necessity, look to the public sphere, and not to the realm of art, for the logic of her work" (Sholette et al. 2004).

Apart from the anti-tradition, AR art has ancestors in Earth art and conceptualism; roots in Fluxus, punk rock, the Situationist International, Fin-de-siècle literature, cyberpunk and 1990s style Interventionism. It cut its teeth with the twenty-first century's international Occupy movements. The Manifest.AR manifesto, from early 2011, posits that AR artists "create subliminal, aesthetic and political AR provocations, triggering Techno-Disturbances in the substratosphere of Online and Offline Experiences… Augmented reality is a new Form of Art, but it is Anti-Art… It is a Relational Conceptual art that Self-Actualizes" (Manifest.AR 2011). Since its inception, Manifest.AR has consistently produced collaborative projects from the public sphere, which have integrated with social movements and revolutions across the globe.

20.6 Usage

When AR browsers became available as mobile applications, it was a *memetic* shift in the usage of AR, from the preconscious imaginings in sci-fi novels with headsets and cyberpunks—to the one from quotidian existence where tourists hold up mobile phones in shopping arcades. Initially, the works of art produced inside of this new usage of AR seemed like they would be a combination of locative media and digital sculpture, which by and large they are, but it has been adapting to the common usage in society. Gibson described the locative artist as "annotating every centimeter of

a place, of every physical thing. Visible to all, on devices…" (Gibson 2007). The "device" referred to is the artist's mobile phone, which is not the preferred method for viewing "locative media" in *Spook Country* (VR headsets are); the artist's mobile phone was a second best—an ad hoc example, put together to illustrate the important locative work the fictional artist made for VR helmets.

Just because an object has certain properties or features, does not preclude that they will be used, or used in the way they were intended. As Sheller notes, "Unlike commercial applications, artists often draw on more disruptive and critical traditions that seek to defamiliarize the familiar, or to heighten our sensual awareness of location, or to offer new forms of place making and public engagement" (Sheller 2013).

The unintended usage of objects being spread from local application to application—is part of the nature of memetic reproduction and variation, and is the way networked media aesthetics create niches in media ecologies. As biologist Richard Dawkins, who coined the term *meme*, explains, "Just as genes propagate themselves in the gene pool by leaping from body to body via sperm and eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process, which in the broad sense, can be called imitation." (Dawkins 1976) This imitation of usage is evident in the way some youths are smashing the screens of their smart phones, in a stylish sort of identity protestation, like the torn jeans of the 1980s (Wax 2013), "a new meme will have a greater chance of penetrating the meme pool if it is consistent with other memes in that environment" (Distin 2005).

The anti-tradition political-aesthetic practices of the Situationist International gained a newfound relevance when Internet browsers became a widely used format. *Psychogeography* is one of these object-practices from SI; it is a way of participating in the world based on the human situation within it, or developing an aesthetic that mitigates between the unseen history of the immediate environment or the psychic artifacts left in our ecosystems, (this connection between Situationist *praxis* and locative media was referenced in *Spook Country* as well). OOO refers to these objects as reflexive objects. Or in Foucault's pre-OOO observation, "a form of reflection… that involves for the first time, man's being in that dimension where thought addresses unthought and articulates itself upon it" (Foucault 1970).

Geolocative AR is still currently in the public sphere, free for anyone to access, and no permits needed to put a POI in a secure location, as with Sander Veenhof and Mark Skwarek's collaborative work from 2010, *infltr.AR* (Fig. 20.4), which put virtual hot air balloons porting Twitter feeds from the outside world into the White House and the Pentagon. Essentially, the White House and the Pentagon are part of the public wilderness that viewers can see from an enclosure and take pictures of. Just like tourists on a road trip through the Midwest USA, it is a true point of interest, in its original context, part of the American Landscape, made for visitor locations, or great places for an anamnestic photograph. Secured government facilities are not wildernesses that are protected per se, but definitely objects that are actively being preserved, and left relatively unknown to the normal citizenry.

Both augmented reality and the wilderness are difference engines, which create entanglements in communities; they are also object-ideas that are not anywhere in

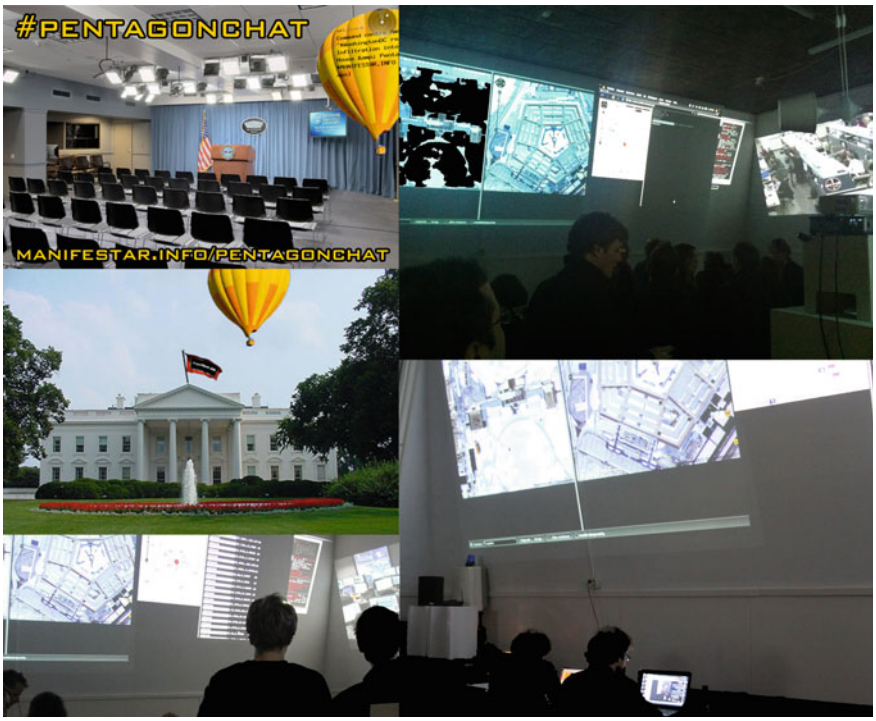

Fig. 20.4 infltr.AR by Mark Skwarek and Sander Veenhof (2010), AR intervention at White House and Pentagon using Twitter. *Photos* Sander Veenhof, used with permission

particular. They are "viscous" global objects, like the Internet and the World Wide Web. Morton refers to these sort of global objects that are both "nonlocal" and "viscous" as *hyperobjects*. One of his key examples is global warming. It is an object that cannot be reduced to a singular object one can touch—a happening and concept in the world that has visible effects and consequences, which can work to illustrate it. With global CO2 at over 400 parts per million, global warming can be seen in extreme weather in the cities on the eastern seaboard, or in Alaska, with glacial retreat.

20.7 Anamnesis

Figure 20.5 is an AR work of mine, *Exit Glacier*, built on site, 120 miles from Anchorage in Kenai Fjords National Park. Exit Glacier is a glacial extension from the Harding Ice Field and derived its name because it was the glacier from which the first white explorers to travel the area used to exit the ice field. It has been in dramatic decline for a several decades now and has shrunk to quite a small size,

Fig. 20.5 Exit Glacier (2001 Terminus) by Nathan Shafer (2013a), five different AR versions of glacial termini where built on location at Exit Glacier, this is the terminus from the year 2001. *Source* Nathan Shafer

compared to its former self, a physical manifestation of both the hyperobject called global warming and another hyperobject called the cryosphere (the sphere of frozen water on the surface of the Earth).

Exit Glacier is one of a very small number of glaciers in the world that are easily accessible from a highway. The US National Park Service has been aggressive in its work to illustrate global warming at this glacier. The AR project digitally reconstructs five of the former termini on location in Kenai Fjords National Park, based wholly on the glacier itself as a reflexive object: 2001 (year of 9/11), 1994 (premiere of Mosaic, the first popular web browser), 1979 (the artist's birth year), 1964 (Good Friday Earthquake in Southcentral Alaska) and 1953 (The Wild One, starring Marlon Brando). These years were selected for their connection to the variety of human experience, relatable to the timeframe of the glacier, setting up an anamnesis of the viewer's environment, projecting their memories and experiences onto the augments that are points of interest at the glacier. There is a viscous collective knowledge intrinsic to the human condition in viewing mediated wilderness, which is activated by language.

Exit Glacier also encapsulates one of the continuous multiplicities for the event of augmenting wilderness, the bits of code needed to make geolocation-based AR work on site. On contemporary mobile devices, the necessary elements which must be active are the compass, gyroscope, accelerometer, GPS, and Internet connectivity. Internet connectivity is the wild card is the group. GPS is usually faster than Wi-Fi and

universally accessible on mobile computers, though Alaska's latitude on the planet can create dead zones in valleys or mountains. The radio waves needed to create wireless fidelity get distorted in the wildernesses of the Earth, as do the signals from GPS satellites. The basic write-around is downloading the entire augment before walking out of cell-range into a pre-connected world, and hope that the GPS stays relative. This is not optimal and incredibly unstable. A portable Wi-Fi signal must be brought into the pre-connected wilderness, like an iron lung, for AR to keep breathing on site.

This is one of the banes of the site-specificity for works of AR art. *Exit Glacier* is built on location. To experience the piece, viewers must drive to Seward, Alaska, and go through the entire process of loading the application and layer on their devices, then carry a Wi-Fi hotspot out to the site with them. Once there, the ebb and flow of the GPS causes the piece to move as you are standing still viewing it. This is not unlike problems Earth art faced. It is a problem of being, the existence of the work itself, without even getting into the meaning or quality of the work. Few people literally went out to view earthworks in situ to evaluate them in person, or meditate in their presence, or whatever viewers do when they view works of art. One of the concerns here is that documentation of the work becomes a keen feature in the process of viewing it, since that is precisely how most viewers will experience it. It involves a certain sense of wandering and tenacity to get to a geocoded POI in person, albeit one more in line with the nineteenth century notion of the flânuer in the city, since metropolitan areas are where POIs tend to be most stable. Benjamin wrote, "the anamnestic intoxication in which the flânuer goes about the city not only feeds on the sensory data taking shape before his eyes but often posses itself of abstract knowledge—indeed, of dead facts—as something experienced and lived through" (Benjamin 1982). Hoy has written that "AR technology encourages a praxis-based approach to spatial knowledge. Its incorporation of mobile computing means that the body is activated in a process of movement and spatial exploration" (Hoy 2013). The "anamnestic intoxication" would be the theoretical body knowledge and inherited collective memory, flooding the viewer on location.

The fact that mobile AR must be viewed through a mediator (smart device) lends itself to a global aesthetic usage. When most AR works are viewed, they can be captured via screen grabs or photos as they actually are. Reproductions of these works can be more artistically mannered, or through proper documentation, have a higher resolution than viewing on site. It is a portion of the human aesthetic that gets disturbed, the way we are intrinsically linked to the places we are at. Breathing on site, or observing a cloud pass in front of the sun, as the POIs stay digitally backlit, seemingly unaware of the solidity of the objects in the environment in which they are placed. The issue that remains for site-specific AR and one that becomes important for the global audience is how to experience a large-scale geolocation-based AR work, without having to travel there.

20.8 Variety and Application

Earth art experienced a similar problem in display, but Smithson's praxis of the *site/non-site* provides a way of adapting to the presentation of AR artworks in formal situations. An earthwork created on site in the mountains is visible to the few who get out there and see it, the GPS-equipped hiker, or tech-savvy flânuer. This is the *site* of the work of art, and it is the same format as a geolocation-based AR piece, like *Exit Glacier*. When the work is displayed in a gallery or museum, Earth artists would make an indoor earthwork, which they called a *non-site.* As Smithson states in *A Provisional Theory of Non-Sites*, "(it) is a three dimensional logical picture that is abstract, yet it represents an actual site…to understand this language of sites is to appreciate the metaphor between the syntactical construct and the complex of idea" (Smithson 1996). A non-site equivalent in AR works is the target-based POI, which locates a work with a displayable target. Ultimately, when AR develops significant collectorship with dealers it will most likely be a target-based enterprise, with AR artists committing their extra energies to developing large geolocation-based works as their flagship projects, that are not for sale. The thing about site-specific AR however is that no matter how intrinsically or technically the POI is tied to a literal geocoordinate, the POI is digital, and it can be in a 1000 places at once, this is part of its regime of attraction; POIs are digital objects that overlay our mediated experiences of the world. AR is by nature, a nonlocal being and a global medium. It is pleasantly unstable and bound to the Earth the way vampires are bound to the moon.

Borealises (Fig. 20.6) is a collaborative work between Christopher Manzione's Virtual Public Art Project (VPAP) and myself and was included in a Manifest.AR group show called *Bushwick: AR Intervention.* It was originally conceived as an AR version of the northern lights to be displayed over Anchorage, which has horrible light pollution in the winter. The northern lights are rarely seen from within the city during our long dark months. AR browsers provided a way to see the borealises on mobile devices when the light pollution obfuscates them. With the global, multiplicitous nature of AR, the original animated POI went up in Bushwick, as part of the group show, at the same time it went up in Anchorage.

Geolocation does not have to be in a singular altitude, latitude, and longitude (the geocode). Putting POIs up in an AR browser is like putting a blog post up on a website (third-party platforms). The direct observation of the work does not have to be on-site, and it rarely is. Gail Rubini and Conrad Gleber, of v1b3 (Video in the Built Environment), made *NEWzzzzz* (Fig. 20.7) as part of the annual *Wintermoot Mixed Reality Festival* (Fig. 20.8) in Anchorage, held during Fur Rendezvous, a festival held around the Iditarod sled dog race, at the close of winter in Alaska.

NEWzzzzz is a scrolling feed of red letters comprised of various headlines from newspapers in rural Alaska. It is relative geolayer, that is, it is visible to anyone who opens the layer, wherever they are, because it is geocoded to be exactly where the mobile device connecting to the layer is. Location is the target.

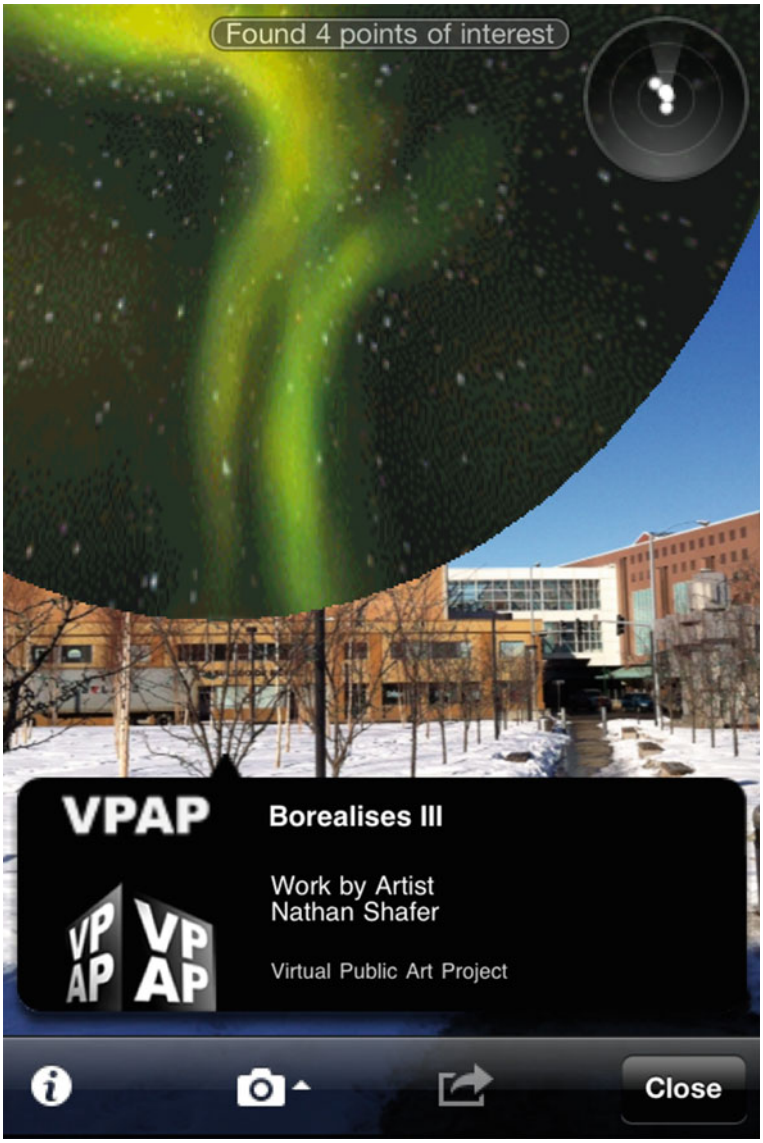

Fig. 20.6 Borealises by Nathan Shafer and the Virtual Public Art Project (2011), digital/animated AR version of the northern lights, displayed above viewers, this screen grab comes from the first Wintermoot Festival in Anchorage, Alaska from 2010. *Photo* Jared Chandler, used with permission

Fig. 20.7 NEWzzzzz by Gail Rubini and Conrad Gleber (2013), AR. *Photo* Nathan Shafer

V1b3 works with the printed word in many of their projects, as well as the integration of projected video in the immediate media ecosystem. *NEWzzzzz* was able to blend these two formats into a mobile application, which illustrated cultural feeds, exterior to most viewers' expectations of them, the same issue of the "VR pipe dreams."

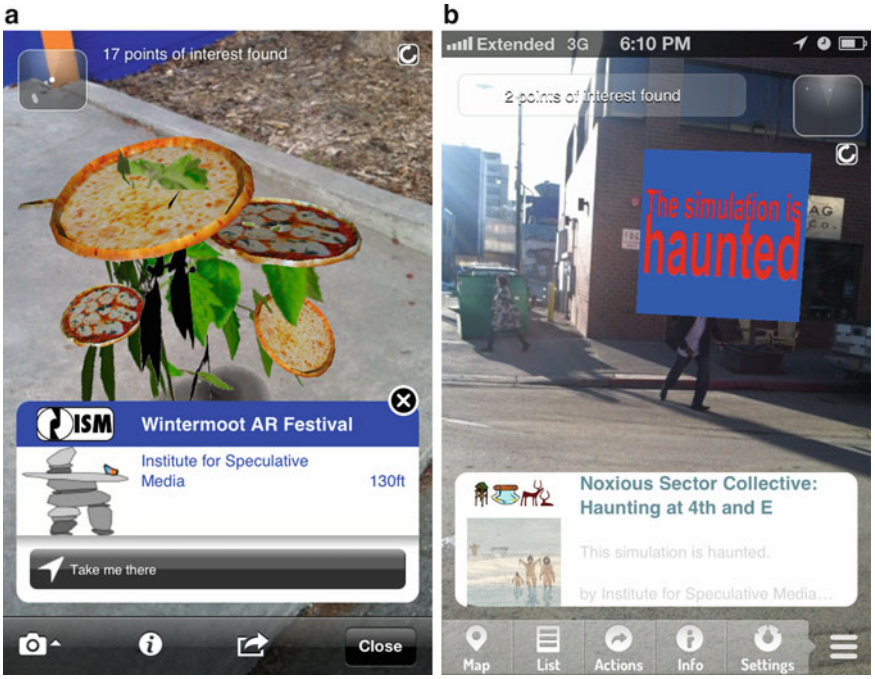

Fig. 20.8 (**a** and **b**) Wintermoot mixed reality festival organized by the Institute for Speculative Media, pictured in **a** Mark Skwarek's Congressional Pizza (*Photo* Nathan Shafer), **b** Noxious Sector Collective, Haunting at 4th and E, (*Photo* Nathan Shafer)

Several artists in Manifest.AR have made relative AR works, Tamiko Thiel's *Reign of Gold* (Fig. 20.9) illustrates the way the global economy occupies every centimeter of our world, for example.

Non-Local (Fig. 20.10) is an on-going digital storytelling project of mine, set in a near-future Anchorage and based on the storytelling traditions of the circumpolar north, mixed with pulp science fiction and online gaming. The project is a series of short digital stories that group together as a larger narrative. In early 2013, *Non-Local* went up simultaneously in three geolayers on the Layar app in Anchorage, Seattle and Skidegate, and one target-based layer on the junaio app in New York. The geolayers were part of a solo show at Noxious Sector in Seattle (Fig. 20.11). They all have a global filter, so the audio tracks could be heard from anywhere in the world, without having to see the local POI in person. Many of the POIs in *Non-Local* are placed in pre-connected worlds and accessible only with the global filter running. They cannot be seen onsite, unless portable Wi-Fi is brought into the ecosystem, it was a way of attempting to make the wilderness accessible from a connected world.

The *Non-Local* augment that went up in New York was a singular audio track called *The Big Bad Broo*, which told the story of two kids who stumble onto a massive alien civilization via a confused avatar in a fictional MRPG called Cosmic Constant. The group show it was included in was by the v1b3 collective with Christopher

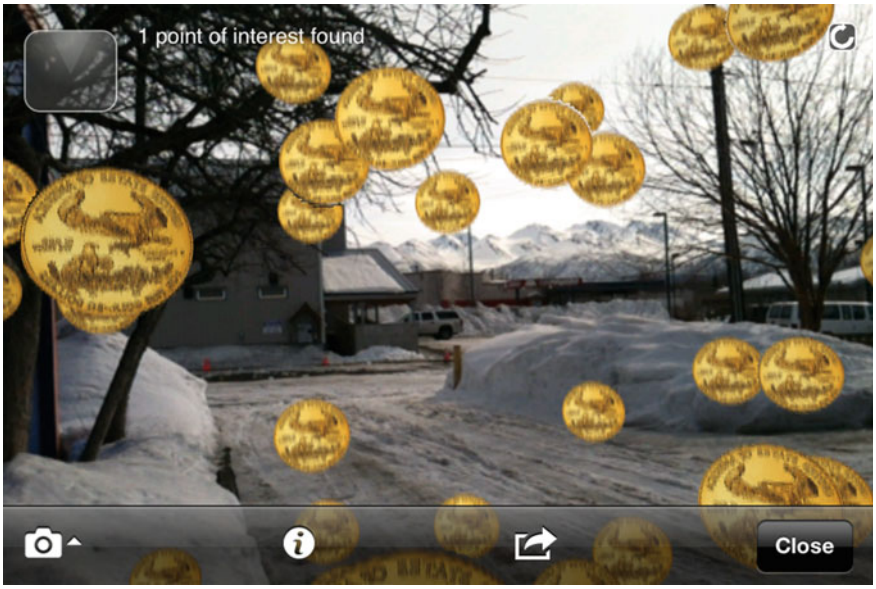

Fig. 20.9 Reign of Gold, Tamiko Thiel, AR. *Photo* Nathan Shafer at Out North Contemporary Art House

Manzione, called *AR2View*. They took photos in a Manhattan hotel, turned the photos into targets, on which they built an AR show, brilliantly illustrating the way AR (from the aesthetic dimension) can literally lay over objects in the real world. They published this book with the target-photos and descriptions of the works. It was the second print project of three, the first, *Scan2Go*, published QR codes, which loaded artist projects. The third publication, *ART2Make*, is a series of g-codes, which can be used to 3D print the entire show of digital sculptures. Gleber has written of v1b3's use of the printed book in new media, "published books are uniquely capable of melding artist imagery with conceptual intentions, with audience curiosity and interaction in much the same way that media artists use the Internet" (Gleber 2013).

EEG AR: Things We Have Lost (Fig. 20.12) is a research/development project by John Craig Freeman and Scott Kildall, which "allows participants to conjure up virtual objects by simply imagining them into existence using brainwave sensor technology" (Freeman 2013). *EEG AR* represents a turning point in the subject matter of augmented reality art, placing more of the actual objects to be presented in the hands (or minds, in this instance) of the participants.

Creat.AR (Fig. 20.13) by Mark Skwarek et al. has a similar praxis, for allowing participants to produce personalized POIs relative to wherever they are on the planet.

The anamnesis intrinsic to both of these projects is procedural to their metaphysical being—existing to reflect the memory of something else. The databases behind both of these projects also mark an emerging method in distributed/relative AR. Instead of just targets or geocodes, there is a relative AR, like v1b3's *NEWzzzzz*, or

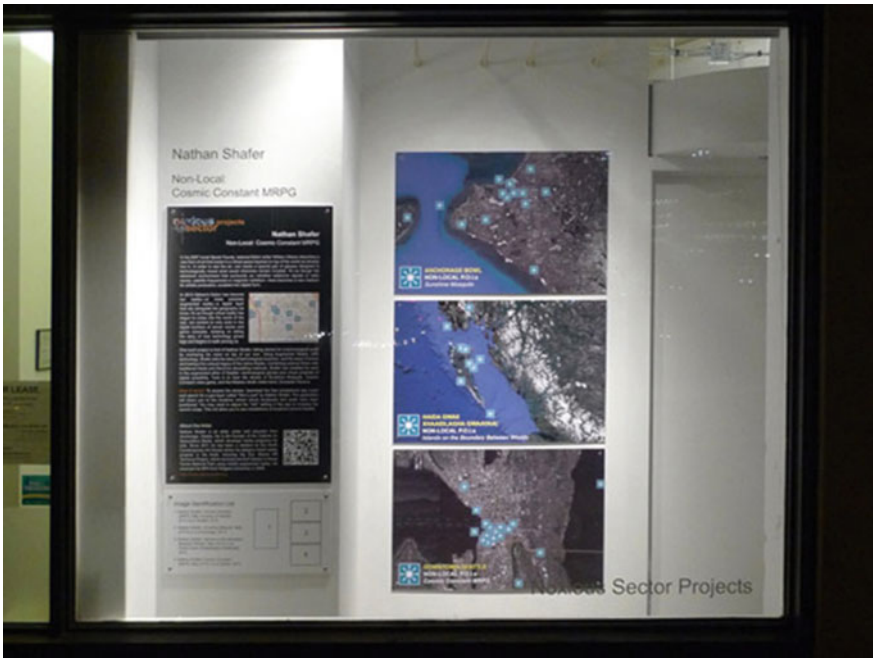

Fig. 20.10 *Non-Local: Cosmic Constant MRPG* by Nathan Shafer (2013b), AR with audio at Noxious Sector Projects, Seattle, Washington, pictured is an installation shot of the show where maps of the POIs were displayed. *Photo* Ted Heibert, used with permission

Thiel's *Reign of Gold*, but it is also enmeshed with the participant who has loaded the AR layer. Users are able to choose the POIs around them.

When *EEG AR* was performed as a lab/clinic at FACT in Liverpool, they ran a room where test subjects would be plugged into a brainwave sensor, which measured their brainwaves, launching an SQL sequence to create POIs from a preloaded database.

Creat.AR lets participants turn anything they want into a POI, which will appear relative to their geocoordinates. Participants do this by typing in what they would like to see on the local layer. Then a database connected to that layer, runs an Internet search, which formats the first image to pop up for the search phrase in the mobile browser.

These two projects are viscous and nonlocal—two properties of Morton's hyperobjects. They are viscous in that, "the more you know about a hyperobject, the more entangled with it you realize you are" (Morton 2010). And nonlocal in that no participant in either project can accurately see the entirety of the work from where they are. Both works are distributed over the worldwide Wi-Fi ecosystem, which is closing in on our pre-connected spaces as we draw air. Anywhere there is a radio signal that can host an Internet connection, AR exists, whether it is manifesting locally or not.

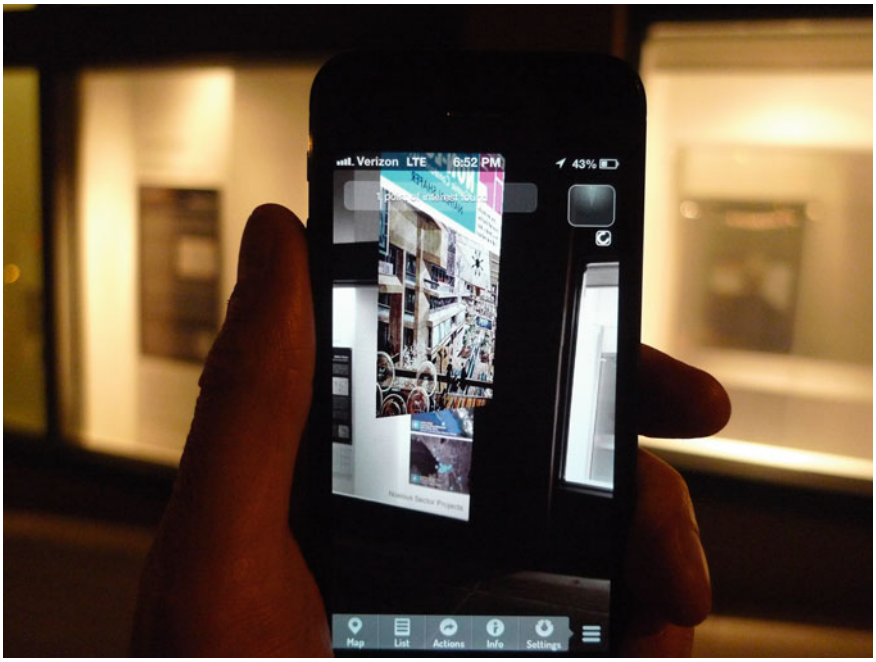

Fig. 20.11 *Non-Local: Cosmic Constant MRPG* by Nathan Shafer (2013b), AR with audio at Noxious Sector Projects, Seattle, Washington, pictured is the local POI at the show, an image of the Cosmic Constant MRPG story as a pulp sci-fi publication. *Photo* Ted Heibert, used with permission

Fig. 20.12 EEG AR: things we have lost by John Craig Freeman and Scott Kildall (2013), AR

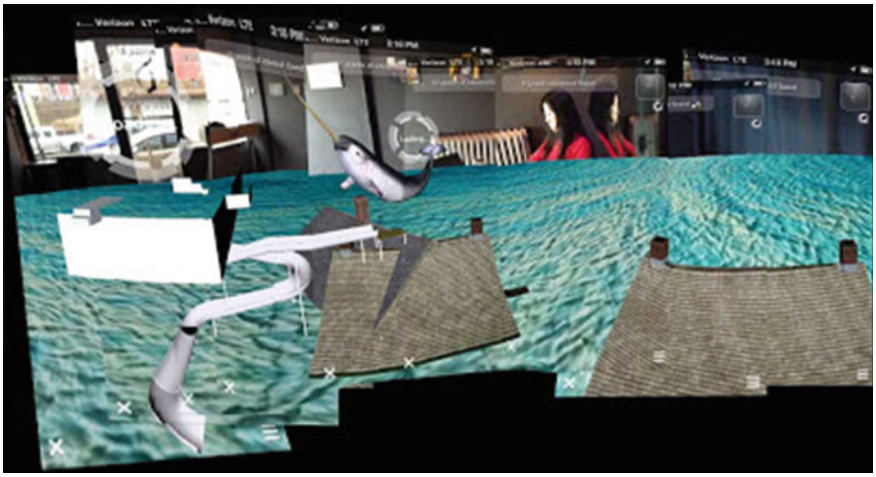

Fig. 20.13 Creat.AR by Mark Skwarek (2013), user-generated AR

The variety and application of these objects inside of the microhabitat of AR, inside the larger media ecosystem, illustrate some of the praxis of augmenting wilderness—their usage entangled with OOO, working to decentralize the human mind as the metaphysical fulcrum upon which the existence of the cosmos hinges, making way for the equanimity for the wilderness outside of our infinitesimal pocket of the universe.

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Chapter 21
Really Fake or Faking Reality? The Riot Grrrls Project

Claudia Hart and Rose Marie May

21.1 Foreword

Research conducted in museums has shown that the average visitor spends only seconds in front of a work of art (Hein 1998). The typical visitor engages in a behaviour that has been called "grazing" or meandering slowly through the museum and only spending seconds looking at any particular artwork (Worts 2003). These are disheartening statistics for museum staff. We spend years carefully developing exhibition content and selecting artworks, and we have the expectation that visitors will share our passion and enthusiasm and want to spend time in our exhibitions.

My role as an Interpretive Planner might be easily explained as the person tasked with solving this problem. Interpretation is a position that emerged in art museums a little more than a decade ago. Specialists in Interpretation are typically Museum Educators with expertise in free-choice learning, visitor motivation, cultural attitudes, accessibility, and modes of response and participation. They work with the Curatorial and Design departments to consider how to present exhibitions to ensure the subjects are intellectually rigorous but also compelling and digestible for a general audience. We think about whether the spaces are navigable and encourage exhibitions teams to consider ways to move beyond the passive experience.

When I was approached by Claudia Hart about working with her SAIC class, I saw an opportunity to offer visitors a more active experience in the Riot Grrrls exhibition and to get people to look at the works of art for a longer period of time which we believe supports deeper engagement and meaning making. Studies have

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shown a positive relationship between the amount of time spent in an exhibition and learning (Borun et al. 1998).

Visitor research is integral to Interpretation at the MCA, and Claudia and I agreed early in the project that her students would be assigned readings on visitor behaviour in museums and that visitor testing would be woven into the development phase of the ARs. At a critical point in their creative process, the students spent an afternoon at the museum demonstrating their interventions to randomly selected visitors. Afterwards the participants were interviewed by a trained researcher asking a series of questions designed to determine if the AR added to their experience. The responses were generally positive. People looked longer at art works than they would have otherwise and saw something new which prompted them to think about the work from a different perspective. We had comments such as: "it made the painting come alive," "it blurs the painting and slows it down," "you are made to look closer at the painting," and "it took something static and animated it." However, the students learned that their AR needed to be easy to navigate, clearly communicate its message, and not last too long.

The Riot Grrrls project was a successful experiment. From the perspective of an Interpretation specialist who is always thinking about how to slow visitors down and create active experiences, AR offers a lot of possibilities. However, we all learned during the course of the project that for AR to work in museums, there are a lot of technical challenges that need to be solved ranging from consistently functioning wireless to either stationary devices that operate the AR or easier download for the app. But, AR does offer opportunities to encourage visitors to linger and engage more deeply.

At the end of the project, Claudia asked me to consider the questions: Is AR the museum of the future or does the mediation block and make more remote the possibility of a more visceral and emotional experience of the art? From my perspective, I think the potential for AR falls somewhere between those two poles. I believe AR offers a vehicle for enhancing and deepening the experience with the artwork. We work to offer multiple ways into the work of art that support different learning styles. AR seems to have an appeal for visitors who want to step out of their own environment and into the world of the artwork and have a more visual and physical experience.

Rosie May

21.2 Introduction

The Riot Grrrls app is a custom augmented reality application developed for the Riot Grrrls exhibition organized by Chief Curator Michael Darling at the Museum of Contemporary Art in Chicago. It was a project developed by the media artist Claudia Hart and her "Virtual Installation" class at the School of the Art Institute

of Chicago in the spring of 2017. Although pedagogical in intent, the layered structure of image-based augmented reality technology, particularly when produced by young students—some still in their teens—was intended by Hart to result in a poetic piece reflecting the passage of time and the humanistic process of art history. Below, Claudia Hart, an artist who has also built custom augmented apps for her live performances and sculptural installations, expanded in a series of essays for the Chicago MCA on what augmented reality can mean for museums and the process behind developing the app.

21.3 Claudia Hart on Re-making the Riot Grrrls

I live in an augmented reality where any image can act like a QR code, taking you deeper into meaning and interpretation—if you have the right app. Image-based augmented reality technology, such as Layar, a provider that offers both commercial software and a public app downloadable for free, permits any image to function like a QR code. How it works is simple: when you point your smartphone's camera at an image, the app allows the camera to read it as a graphical code. The app then sends that code up to the Cloud, which beams down a related animation stored there. You can see this layered animation over or resting somewhere near the connected image. Image-based AR relies both on active wireless and plentiful images, making a museum its natural habitat, particularly when it is placed in the hands of a visual artist.

I first explored how these apps could influence interpretation in museums in 2016, when my Virtual Installation class at the School of the Art Institute developed the *Romantic App*.[1] Created in conversation with Gloria Groom, Chair of European Painting and Sculpture at the Art Institute of Chicago (AIC) and her curating staff, the app engaged with the AIC's late nineteenth and early twentieth-century collection. In developing this app, my students and I took a media-archaeological approach to intervene and bring to the fore the effects industrialization and developments in photography had on artists. This was inspired by the current aesthetic paradigm shift, which is on par with the nineteenth century: a move from painting to photography; photography to the internet age. By overlaying and integrating the work of young artists into paintings by artists from another time, I saw the profound way that AR apps can comment on the passage of art historical time.

For the next iteration of my class, I wanted an even more challenging subject. I knew that intervening in a museum with a contemporary position—meaning intervening in the works of living artists—could be a good challenge for my students. I looked into the MCA and found the perfect exhibition to augment: Riot Grrrls,[2] a presentation of abstract paintings from the museum's collection, organized by Chief Curator Michael Darling (Wellen 2017; McKie 2017; MacDonald 2017). Riot Grrrls

[1] http://romanticapp.tumblr.com/.

[2] https://mcachicago.org/Exhibitions/2016/Riot-Grrrls.

was a feminist and queer punk-rock movement during the 1990s that was known for its powerful zine culture (Darms 2014; Schilt 2004). For me, the connection of contemporary digital media apps to both the marketing and entertainment industries (mail-order catalogues and the wildly successful, albeit short-lived, Pokémon app) and the historical relationship of today's Internet bloggers to nineties zines was inspiring. Our current digital paradigm shift was nascent in the Riot Grrrls movement! This exhibition was ripe for art pedagogy.

I contacted the MCA's Manilow Senior Curator Omar Kholeif, who generously connected me to Rosie May, Associate Director of Education: Public Programs and Interpretive Practices. She met with my class and we immediately proposed a Riot Grrrls app zine-cum-blog and catalogue, and a performative demo and tour of the Riot Grrrls show using the app. As part of our research, May gave us scholarly papers on museum apps to read, and then opened up the entire infrastructure of the museum to us. Amazingly, everyone was open to everything.

In February, Michael Darling spoke with my students, laying out in the open his curatorial process and sharing his analytic decision-making with rigorous criticality. The students were thrilled, and it opened the door for some of them to comment critically on museological processes in their projects. In fact, the first artists to work with augmented reality positioned themselves in relationship to institutional critique movement that included artists like Andrea Fraser, Martha Rosler, and Renée Green. "WeARinMoMA" (2010), organized by Mark Skwarek and Sanders Veenhof, was the first museum intervention by contemporary AR artists. The group producing it evolved into *Manifest AR*, an important new media art collective formed in 2011, which developed critical augmented reality interventions at museums and geo-political sites in an attempt to question and challenge institutions and world events.

A critical approach is actually embedded in the very structure of augmented reality apps. As a medium, AR lends itself to institutional critique as much as it does to the kind of historiological commentary made by my students in the *Romantic App* and currently being made by many of my students with their works for the Riot Grrrls app. Through the layering lens of an augmented app, we can see the process of art history itself, which accounts for a large part of its uncanny delightfulness.

21.4 Forms of Feminism: Responses to Riot Grrrls by the SAIC Virtual Installation Students

Some of the initial concept sketches for The Riot Grrrls app and some screenshots of the resulting augments are intermingled below. The concept sketches were conceptualized as "zines" in honour of the 1990s feminist group, the Riot Grrrls whose punk-rock project was distinguished by its zine culture. The augments evolved differently, through experimentations on site and conversations with exhibition visitors.

21.4.1 *Francesca Udeschini on the Augment of Molly Zuckerman-Hartung's "Hedda Gabler"*

The inspiration for my augment stems from Molly Zuckerman-Hartung's unique historical connection to the Riot Grrrls. She is the sole artist in the exhibition who was actually part of their culture!

The grayscale palette of the piece, its graffiti elements, it's tin foil and push pins—to me, all of it points towards the assemblage aesthetic of the Riot Grrrls' zines. After looking at many examples of these zines and others, I started thinking about DIY methods of distributing printed materials and screen printing, and how it relates to band and concert posters. From there, I thought it would be interesting to take the graphic elements of these paper-based, analogue methods and combine them with the entirely digital technology of augmented reality.

My augment consists of a digital transformation of the original painting into a black-and-white bitmap, as though the image were being prepared for screen printing (Fig. 21.1). Using alpha channels, the dots are transformed into transparent sections, so that the original painting can shine through. The movement of the dots creates a rhythmic, almost psychedelic pattern that offers a different kind of abstraction over the original, abstract painting.

The beauty of augmented reality is that, in its overlay of virtual image, something entirely new is created. It is a process that combines continuity and change, thus offering a possibility for transformation.

21.4.2 *Jonatan Martinez on the Augment of Tomma Abts's 'Dele'*

To create augments means to forge new ground. Augmenting reality allows a viewer to look at art and history layered with the present and in so doing shows us a way to move forward. When we embrace AR and new mediums, we are able to look into the future of our world. It is very important that the MCA is open to new technologies.

At this moment, such actions are transformative for art and art institutions. Art institutions and the art establishment are currently going through a rapid change. Change is not usually facilitated by institutions, who are usually willing to go with the flow of artistic creation and of society at large. I am really grateful that there at least are a few institutions that are willing to shake their own foundations in order to continue to grow.

This kind of idealism is related to the ideals that the Riot Grrrls had in mind: to shake the current order to make way for cultural, social, political and human growth. "Brash, bold, and unafraid to take space," is written in the wall text for the Riot Grrrls exhibition we are working with. So, my particular intention for Tomma Abts's work (Figs. 21.2 and 21.3) is to literally take up a lot of space! I explode her painting into space and, in my mind, give new life to the institution. I hope visitors can feel a sense

Fig. 21.1 Riot Grrrls app Augment, 2017 by Francesca Udeschini on Molly Zuckerman-Hartung's *Hedda Gabler*, 2011. Collection Museum of Contemporary Art Chicago, Bernice and Kenneth Newberger Fund. Screenshot: Tiffany Holmes, used with permission

of excitement and inquiry when viewing the augment, and spend more time in the exhibition. I want them to be aware of women artists. To see the potential of new media. To look at art through a different lens. And most importantly, to feel their own inner Riot Grrrls!

Fig. 21.2 Jonatan Martinez concept sketch for augment for a painting by Tomma Abts, Courtesy of Jonatan Martinez, used with permission

21.4.3 Alex Mendoza on the Augment of Judy Ledgerwood's 'Sailors See Green'

For this project, I approached augmented reality as the process of giving a mediated makeover to both an historical object and the context in which that object exists. In my case, that object is the painting *Sailors See Green* (2013) by Judy Ledgerwood, which exists in the context of the white wall of the MCA, feminist history (both art and generally), and the nineties punk collective Riot Grrrls (who do not have a place on the wall of said museum!), among other things (Fig. 21.4). My intention

Fig. 21.3. 2017 Screenshot of augment by Jonatan Martinez (Courtesy of Jonatan Martinez, used with permission.) over Tomma Abts's *Dele*, 2014, Acrylic and oil on canvas, 19 3/16 × 15 1/16 in. (48.7 × 38.3 cm), Collection Museum of Contemporary Art Chicago, gift of Marshall Field's by exchange, 2015.3

was to identify, break down, and express the many issues and concerns encountered by my *Virtual Installation* class as a whole, and also by me personally—as a male artist—while developing and executing this exhibition app.

21.4.4 Christina Chin on "Love Letter to a Violet" Augment by Ellen Burkenblit

The goal for my AR is to respond to the sexist atmosphere of the art world and also of aspects of this exhibition! My AR uses the context behind Ellen Burkenblit's *Love Letter to a Violet* to reveal a deeper meaning (Fig. 21.5). I am adding to this painting a series of women who are fighting their hardest, yet still are unable to break out of the realm of sexism. The images shown are appropriated from Hollywood films to match the pop art style of the painting and to reference how women are represented in the media. The audio I chose to use in my augment is of women throughout history, including political figures like Hillary Clinton, who have chosen to speak

Fig. 21.4 Alex Mendoza concept sketch (courtesy Alex Mendoza) for an augment of *Sailors See Green* by Judy Ledgerwood, 2013. Oil and metallic oil on canvas; 96 1/8 × 78 1/16 in. (249.2 × 198.3 cm). Collection Museum of Contemporary Art Chicago, gift of Katherine S. Schamberg by exchange 2014.3. © 2013 Judy Ledgerwood Photo: Nathan Keay, © MCA Chicago, used with permission

out against sexism in its many forms. These are all layered on top of each other to create a kind of cacophony, which is meant to elicit frustration and be overwhelming to viewers—giving them a small sense of how most women artists feel.

Fig. 21.5 Christina Chine, Rendering of the augmentation (courtesy of Christina Chin) for Ellen Berkenblit's *Love Letter to a Violet*, 2015, Oil, charcoal, and oil stick on linen, 91 1/2 × 79 7/16 in. (232.4 × 201.8 cm) Collection Museum of Contemporary Art Chicago Restricted gift of Sara Albrecht 2015.17, © MCA Chicago, used with permission

21.4.5 Beier Zong on the Mary Heilmann's 'Metropolitan'

The goal for my augmented piece is to expand on the painting by rechannelling it as information, layer upon layer. I wanted to add time elements to static 2D images and give them an organic sense of life. I am attempting to illustrate new ways of defining an exhibition, and hopefully even change the viewing behaviour of exhibition goers. Mary Heilmann's paintings are conceptually two-dimensional sculpture, confirmed by the objects and installations that she sometimes makes. Extending her method, I created 2D sculptures (2D representations of sculptures) based on a photograph of her

painting (Fig. 21.6). I want viewers to see the workings of my mind, thereby turning her painting into a kind of living creature, growing and expanding and evolving before their eyes.

Fig. 21.6 2017 Rendering of Mary Heilman augmentation by Beier Zong (courtesy of Beier Zong) over Mary Heilmann's *Metropolitan*, 1999. Oil on canvas; 75 × 60 in. (190.5 × 152.5 cm). Collection Museum of Contemporary Art Chicago, gift of Mary and Earle Ludgin by exchange, 2012.13. © 1999 Mary Heilmann, Photo: Nathan Keay, © MCA Chicago, used with permission

21.5 Afterword: Reflecting on the Riot Grrrls App

Dear MCA,

When I approached you in the summer of 2016, I had only the vaguest notion of what might become of the project I was proposing: an "augmented" app called Riot Grrrls. As it evolved, so did my role in the process. From the usual role of professor at SAIC, I found myself performing something more akin to a conductor or choreographer, coordinating what turned out to be completely unrehearsed moving parts. In this case, the moving parts consisted of your staff in all its variety, from your Chief Curator to your Production Editor, your Director of Digital Media and Chief Content Officer to your Associate Director of Education: Public Programs and Interpretive Practices (jobs I'd never heard of before); the great SAIC students, central to my particular role; and finally, though equally significant, the audience—the actual museum goers themselves!

This extensive list reveals the complexity of your field of study: a concept, also previously a stranger to me, called museology, or "the science or practice of organizing, arranging, and managing museums." I now think of museology as a collaborative discipline in which museum professionals and artists (my students and the artists in the exhibition, who I never met but were nonetheless the centre of our gravity) perform a kind of pas-de-deux (or three or four). In this dance, augmented reality is like a staccato element within the composition, punctuating each work in the exhibition and bringing a different kind of energy and excitement to the piece.

Within our *pas-de-deux*, our app acts as a conversation starter, a kind of glue that brings visitors together and breaks down boundaries between the viewer and the art. Someone looking at a painting through a phone with rapt attention enacts a very seductive performance. People tend to look over shoulders, to ask one another, "What are you DOING?" This creates dialogue about the exhibition, about its paintings, and about how cool it all is (a favourite word of the app users). I think this happens not just because visitors are looking at the paintings through their very treasured phones, but also because augmented reality is a variety of current high-tech trends that represent the way we live now. When visitors use our app, they are layering related digital animations over more familiar paintings to produce new, unexpected, and very contemporary versions of painting! Together this makes for an enthralling experience: the high and the low, the historic and the current moment, the remoteness of high art to the everyday things we do in our normal lives.

So, my dear MCA, the final act of the SAIC "Riot Grrrls App Show" was, to me as conductor and choreographer, an improvisation—both a pleasure and a surprise. I discovered that augmented reality apps are a kind of museum in a bottle, a device to make curatorial connections, open up different worlds, and create dialogues between the art and the visitor and among museum visitors. I couldn't be more pleased with the result and more grateful for the experience!

xxxxx

Your friend,

Claudia.

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Concluding Remarks: Today's Vision of an Art Form of the Future

Vladimir Geroimenko

"The future of Augmented Reality is bright." This would probably be the best sentence to start these concluding thoughts with. The problem is that so many books on so many topics have already used a similar sentence for their final chapters, but no one is now aware or cares about many of those topics anymore. So, what about Augmented Reality? Is it going to stay with mankind forever or just for a while? As it was with many other information technologies, only time can provide a correct answer to this question.

What about today? To what extent can we be sure about a promising future for Augmented Reality and also a new form of art, based on this emerging technology? From the birth of mankind until the end of the twentieth century, humans have lived in a single world (that we can now call the real reality). The invention of computers and the Internet has added a new realm of reality—a complex, exciting and useful digital world. Since then, we are living in the two different worlds (physical and digital), but not at the same time—at least, in terms our perception and attention. This is where Augmented Reality comes into play. This unique technology enables the very existence of a new world that is a mixture of the real and the digital. Augmented or Mixed Reality implants digital content into physical world in order to augment and enhance the latter. It makes it possible to experience digital world without leaving the physical one. Augmented Reality is a crucial step from a dualism of physical and digital worlds to their unity, and this makes that technology of paramount value to the future of humankind.

Augmented Reality Art is not only a novel creative medium, it is bound to become an organic part of the emerging hybrid world. It brings a new type of artworks into physical world—works that can be at any place, of any size and of any structural and functional complexity. Any part of physical world can now be used as an artistic canvas, a computer screen or a gallery. Digital art augments the physical world in a creative way, and we have every reason to predict that this new art form will stay with us forever.

What is next? Next is an exciting creative practice in the new emerging world and also intensive research into every facet of the newborn form of art. Now in its third edition, this book will continue to inspire new books, new conferences, new

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exhibitions and new groundbreaking artworks. This is why this pioneering book has been dedicated to the future generations of Augmented Reality artists.