SmArt Spaces: Restructuring Art Galleries as Interactive Portals

Glenn A. Terpstra(✉) and Laura A. Huisinga

California State University Fresno, Fresno, CA 93702, USA
terpstra@mail.fresnostate.edu

Abstract. Continued oscillation between digital environments and physical realities has created a demand for hyper-interactive community spaces. Because the overall cost of prototyping extended reality (XR) experiences can require large initial investments of time and money, current art spaces could be used for prototyping digital environments with physical spaces. Integrating an art gallery with digital sensors, cameras, and projectors could allow for rapid prototyping of XR development, solving rudimentary problems found with spatial navigation, sensory exposure, and psychological ramifications in a more cost efficient manner.

Not only do these SmArt Spaces provide pivotal community engagement centers, they act as cultural hubs transcending divisions based on location. Connecting multiple spaces with virtual, and mixed reality experiences embrace concepts of the omni-connected environments in the near future. Integrating the primal functions of both art and an art gallery in the form of experience engages those willing to enter the space and provides an excellent opportunity for XR prototyping case studies. These spaces would naturally develop as community research centers and allow for a centralization of cultural experience and organization.

This writing aims to establish a baseline of artistic explorations relating to the interconnectivity of all humans through technology. Combining culture, location, and communication this seminal work attempts to better define underlying truths to how humans experience while providing a synthesis of physical and digital elements in order to create future SmArt Spaces

Keywords: Experience design · Mixed reality · Art and design

1 Introduction

This research explores controlled spatial designs, such as art galleries, showing how people navigate space and different interactive components in a physical environment, to better design digital Extended Reality (XR) environments. The results of this research provides a potential framework for future interactive community collectives of digitally charged art galleries world-wide. Experience is one of the foundations to human existence and should be used as a vehicle to better explain where we come from as well as represent where we are currently.

Experience design goes well beyond technology and it is pertinent to question the assets we currently have in our communities, ripe for adaptation to social equalizing

C. Stephanidis et al. (Eds.): HCII 2020, CCIS 1294, pp. 411–418, 2020.
https://doi.org/10.1007/978-3-030-60703-6_53

design philosophies. The primary goal of this research is to connect different environments that define cultural norms seen in artistic expressions throughout the world. These art spaces can act as technology safe havens where anyone has access to super computing power and connect with anyone in similar SmArt Spaces. Because divisions of technology there is a rising gap beyond just having the technology but, between those embracing all computing power possible versus the majority of computing being done from a phone or mobile device. These are elements beyond the scope of this research but are considered as a reason and purpose for community based technology infused engagement points.

1.1 History and Future Needs

On the most basic level a work of art shares an idea, art galleries share collections of ideas, different towns or cities have different collections of galleries, regions and beyond all establish definitive and measurable inferences of how we all see the world differently, not only because of our independence, but the environments that influence us. "The number of basic colors depends largely on who you ask: a neurophysiologist, a psychologist, a painter, a philosopher, a photographer, a painter, a stage designer and a computer graphics expert will all have different answers" [1]. If all perspectives are original then it becomes critical to allow the viewer of art influence the art they are seeing. With recent advances in XR interfaces possibilities of interconnected communication and shared experiences can reach a new level for all humanity.

1.2 Simple and Scalable

Producing a low-cost interactive space from art galleries opens communities, both urban and rural, to an unattainable operating system. Everyday art viewers, local makers, artists, researchers, and community endeavors would all benefit from a space that reacted to their presence and reminded of the global perspective. As these spaces develop beyond simple art installations, they will evolve to collect measurable data that can influence or change environments in a different part of the world.

Embracing the artistic exploration of experience design removes the limits sciences places on exploration and engages not only raw human interaction but the cultural, emotional, and openness imagination allows for. By releasing specific constructs researchers and designers are able to infer solutions that were previous not visible.

Viewers entering an art gallery space could change what they are looking at. Based on the collapsing powers of experience all art is perceived as a unique documentation of a point in space and time, while in truth, art is not real until experienced. Acting as a founding principle to experience itself, it becomes critical to analyze and dissect experience through relative terms and if possible, through the quantifiable structures of bigdata and artificial intelligence processing.

One art show experience connecting several art galleries throughout the world could be used as a metric to compare data produced by viewers in the space on an infinite level of complexity. The purpose comes back to the average community member being able to interact with a specific environment either controlled by or controlling how they interact in the space. This concept investigates physical

environments, through virtual reality art galleries, to provide a constantly changing art experience. As a result this produces qualitative data charged with psychologic undertones based in spatial design.

2 Background

The Intelligent Interior Design Framework (IIDF) Developed by Professor Holly Sowles [2] defines three domains, Smart Geometry, Information Modeling and Ambient Intelligence. Smart Geometry uses parametric or algorithms to create designs. Information Modeling uses integrated software to create kinetic deployable designs. Finally, Ambient Intelligence uses sensors that are activated through interaction and interfaces to provide non-obtrusive assistance. The vision for these SmArt Spaces utilizes all three of the IIDF domains [2].

2.1 Experience Design

Experience design is the relationship we have with the world. We do not usually notice when an experience is well designed but we certainly notice when one is poorly designed. Often experience design is talked about in the realm of websites or applications, however experience design is all around us and covers many aspects of our lives. How we move through spaces or interact with our environment is often influenced by the design of that experience.

2.2 Environmental vs Digital Environments

As we engage with developing 5G technologies, the Web 3.0 or the Spatial Web, can start to come online.

> "The term "spatial" in the Spatial Web references how our future interfaces enable a web that extends beyond the screen to integrate and embed spatial content and interactions, facilitated by distributed computing, decentralized data, ubiquitous intelligence and ambient, persistent, edge computing [3]".

The Spatial Web will enable an extended reality to permeate our physical reality and allow a blending of the physical and digital environments. When this happens our physical environments, or hardware will be activated by dimensions of information seen as the software overlay. Data blends the two worlds seamlessly and the results leave us wondering where the significance of experience resides.

2.3 Navigating Space or Space Navigating You

We navigate through space on a daily basis but do not consider how we are choosing to navigate or if we are really making decisions of how we navigate. The cartesian mind would infer we can move in relative terms to previous known positions. Descartes *cogito, ergo sum*, or *I think therefore I am*, leaves us with significance placed on experience in order to determine our own realities.

Intentionally designed environments create a flow of movement through the space that guides our experience in the space. Even when making decisions about how we navigate, the way an environment is designed sets up the experience we will have in the space. Signage and wayfinding can direct us through a space but strategically placed interior elements and the use of ambient intelligence can drive an experience that seamlessly moves us through a space in an intentional way.

3 Evidence

The primary form of evidence for this research begins with an experience designed art installation in the January 2020 at the Conley Art Gallery at California State University, Fresno. The purpose of the show provides the viewer with five experience driven art installations that challenges how we look at art on a wall in an art gallery. Attention to how we see rather than what we are looking at is worth questioning as all elements and events will be recorded and reviewable in the future altering our perceptions of time. The work has artistic merit with each work independently, but the whole experience of the space and who you share the space with matters just as much if not more. This is the first art space manipulation by the SIXhalf Artist Collective in order to develop SmArt Spaces as a community engagement point. The two contributing artists Robert Hagen and Glenn Terpstra produced the environment as a way to begin the discussion of what people expect from art galleries both locally and globally.

3.1 Perspectrum: A Human Eye Versus the Word [4]

Perspectrum is an artistic installation that places the viewer in a variety of environments intended to make them think twice about how and what they perceive as art in a gallery. Breaking the stereotype of framed work on a wall, this exhibit capitalizes on sensory experience to provide a new lens to understand the world around us. How we conduct ourselves in a community space has certain connotations and expectations that can be shifted when the anticipated environment is rewired or flipped upside down. This action encourages the same reflection on our current cancel culture and post-truth society.

Though the work presented is deeply rooted in intelligent interiors research, the installations take advantage of the chaos and influence new technologies have on our current and future lives. Simultaneously each piece subtly questions what you had previously been looking at, due to a change of perspective. Micro/macro relations, moments of time, and the collapse of a superposition creates an environment worthy of slowing down, reflecting, and realizing the power held with perception.

Showing installations and paintings in changing light drives a core theme of the exhibit, to encourage a shift in perspective, in order to better understand innate perceptions. By creating works that alter how we look at, hear or experience an idea, points to the significance of uniqueness and individuality. Each of us have a history of values and culture influencing our perceptions–realizing the wide range of perspectives is critical if we are to navigate the development of Artificial Intelligence and should be thought of as a spectrum over ones and zeros.

3.2 Word Wall and a Full Range of Emotion

Being directed to the left upon entering the exhibit a viewer is faced with choice from the beginning, follow the flow or go right, ignoring signage and entering through the exit. Comprised of 19 triangle panels with screen printed words on them, this work is arranged by students at California State University, Fresno through a workshop held in the Conley gallery. Three teams of students collaborated to produce design proposals for the space and defended their experience designs to the group as a whole.

The arrangement of the first six triangles represent stability and structure while the second arrangement of six triangles indicate stability is not guaranteed. Ultimately chaos consumes attempts of order as triangles randomly scattered through the space. This arrangement looks at the constant flux between order and chaos through physical arrangement of panels, constant lighting changes, and the directed experience by following the flow of the space.

Each of these panels produce a unique collection of words, six colors have been chosen to represent six essential emotions, (Happy-Pink, Disgust-Green, Sadness-Violet, Anger-Yellow, Fear-Blue, Orange-Surprise). The words chosen to print are synonyms of these six core words. When light matching the colors used for each emotion causes them to fade away and reveals alternative emotions. The interplay of words and emotions begins to question how different lighting can alter emotion and even influence experience.

Once passing the installation, a reveal to the entirety of the galley gives the viewer a choice of navigation rather than a suggested path as experienced with the initial entrance. To the left is a sound installation intended to shift how we think of sound. This data driven work is comprised of recordings from Fresno, California sounds based on current environment conditions. the walls are white boxes with color changing circles and a five panel print installation. Centrally located is an interactive living installation with a motion responsive coffee table, and to the right is a wall of lenses looking through the wall of light from the first installation. At this point the viewer must reflect on which space to enter and react to the idea that others could have been watching their experience previously.

3.3 Small Worlds

The collection of paintings has been encased in white boxes mounted to the wall, small holes cut into the face of these boxes allows changing light to take the form of floating circles. When viewed from a distance it is hard to not compare the different worlds, though the details of these worlds can not be determined. When moving closer to any one world changes fixation from the series as a whole to an individual cluster of circles in one world. This transition forces the decision of what hole to look through that tends to lead to looking through an additional hole for comparison.

The purity of curiosity drives a constant change to what is being viewed and in is the collapse of a superposition established prior to looking through one hole. This choice creates a singularity of perspective, observing a world that is still changing due to the light within the box. It is hard to put a limit to which hole is looked through, but if this was the case, using technology could provide more information than is

observable with the naked eye. Placing a smartphone camera to one of these holes could reveal the entirety of any painting with a wide-angle lens. Taking a photo of one of these tinyworlds would flatten the observable reality and represent a moment of time for that world. Sharing this world on social media is an entirely different mechanism all together and is a launching point for new interpretations and experience beyond gallery spaces.

Technology is seen as a great equalizer and seeing in these boxes can be enhanced through the use of a digital advantage. According to principles of universal design, this work would fail greatly due to limitations of access. This is intentional as a means to reflect on what is not accessible to all requires mechanisms of equalizations in how we interact with our environments. Making all things accessible helps all to access them.

The paintings within these boxes have several layers of color that shift how the world is viewed and imply the quantum nature of the world around us. Because the worlds are in constant flux the color theory of the painting results in different layers coming forward and going backward, activating an otherwise stagnant environment. The layers of paint and the chaotic nature of application reflect on the post impressionists, but through the lens of an RGB LED world of light over natural light. Lighting has the ability to adjust experience and can greatly impact how one interprets that experience. It is critical to reflect on the impact exposure to unnatural lights from our devices and screens both physically and psychologically.

3.4 Listening

Audio visual artist Robert Hagen continues with describing the next environment altering installation,

> *Listening is a dynamic composition and musical space that draws upon live data streams retrieved from Fresno itself and programming methods to create an ever-changing music. Lacking motivic, melodic, or harmonic structure, Listening is driven purely by Fresno as a community, a city, and the layers of data that comprise it. The sound of Listening is always unique from day to day and moment to moment - each moment unrepeatable.*
>
> *Here you can listen to Fresno, the nearby seismic activity, the humidity, the quality of the air, the direction of the wind, the sounds of the San Joaquin River. Listening invites the listener to meditate in a space which reflects its exterior. The outside is brought in, creating an ambient intelligence that asks the listener to listen wholly and look inwards* [4].

The sound field is constantly generating new waves of auditory exploration and provides a space that alters how you can use your ears for new ways of interpretation. The deep blue and violet fabric walls dampen external sounds and allow the listener to not be distracted by visuals but rather focus on the sound field produced by eight hanging speakers and two subwoofers. A rich neon violet rope light illuminates the end of the room, activating the fabrics and mimicking the rhythm of the San Joaquin River, where the installation sounds originate from. Fluctuations of the various source samples depend on actual input data from nature surrounding Fresno, California.

This experience produces new ways to interpret this data and paints an auditory picture of how these sounds come together. If the weather outside the gallery is uncomfortable the sounds in the installation reflect this discomfort. If there were to be

an earthquake the seismic readings as an input to the installation would force an audio output reflecting this extreme intensity with loud rumbling.

3.5 Living

Creating an environment where a viewer can fantasize about the future technology is possible with motion sensing cameras that change the content of your physical experience. Hagen continues to explain,

> *Living envisions the coffee table book of an unknown future - one that is perhaps human, or perhaps enhanced by AI, sentient computing, or other advanced robotics. In a broken modernity where devices and tech serve as walls between people, Living presents an interactive and intelligent screen which encourages people to gather together. Gesture and space are intuitive and expansive in rooms that have awareness of their designers and guests.*
>
> *Sustainable and intelligent design can improve and enhance daily life without being novel in the extreme. Smart furniture may reinvent the former centerpieces of a home such as the dining table and television but Living also questions the necessity of the coffee table book and other excesses of materialism.* [4].

3.6 Levelalls

This series of 5 prints comes from an 8" × 10" painting and shows how scale, medium, and reproduction changes interpretation. The subject matter shows the last scramble for resources experienced by the Levelalls who inhabit earth in the future. Waste left behind by humans, has till this point, proved to be a valuable energy supply and is now running out. The mass chaos that occurs symbolize the over-saturation of content we experience today. Tones of magenta plague the environment and tie the space and time back to our current attention seeking culture.

Using magenta is crucial to the exhibit as a whole because of the short circuiting that happens in our brains in order to see this color. Red, Blue, and Green cones in our eyes produce a good range of hue for us to understand our environments but, on an electromagnetic level, the frequency for a magenta color struggles to exist within our visible spectrum. This is a lie our brains fabricate to suggest a circular connection of the colors we experience but has a greater impact with the creation of RGB LEDs. Breaking this painting up into five distinct prints isolates the content of the whole and allows for deconstruction of an otherwise overwhelming environment.

3.7 Results

The designed space of the Perspectrum exhibit provides several real-world case examples worthy of exploring further, such as how people view work or generating a heatmap of viewer movements. Determining universal design principals can help ensure accessibility to all experiences equally, or at a minimum help determine where some sticking points arise in spatial design or designed environments. When we think of art spaces, they tend to be made of art on a wall or podium, when in reality the spaces tend to be designed to manage movement of the viewer between these points. Considering how one engages with an element is just as significant as the element itself and why this research will continue to determine how people interact with space.

4 Connections

How we see the world and navigate daily challenges is mostly done without thinking. When a gallery space is predictable it becomes formulaic, leading to an inefficient mechanism for an artist to share their work. We are inundated with visual stimulus from the moment we wake to sleep and do not consider what this does to our actions and way of life. Moving screens closer and closer to our eyes will lead to the point of transition, where the content is within us and we no longer share what we are looking at.

4.1 Theory to Model

Beyond this dark interpretation, it is significant to research how we move through physical environments and question how people would interact with a space they can control. Ideally there is a dualism of an art exhibit where physically movable elements of various sizes act as markers within the space and can be arranged by all who visit the space. By moving these elements in the physical space, a virtual gallery of the space would change as a result. This may not seem significant, but the process begins to show threads of a double blind study. Giving people permission to move art frees the constructs of a gallery space and since it is in the name of art, more liberty and subliminal intuitions come to the surface. An art space as a data collecting interactive hub of digital program development would save time and money for XR by moving prototype development to an improved starting point based on the highly authentic data driven results.

4.2 Conclusions

The ending of this research is the beginning of a new chapter, the results are still being processed and will continue to evolve over time. The ultimate take away is that people strive for community discussion and forgotten art galleries could solve an endless array of problems for a multitude of situations. Considering the great things an artist makes on a miniscule budget, give artists access to good tech and the digital synthesis of neighborhoods will naturally follow.

References

1. Elkins, J.: How to Use Your Eyes, p. 202. Routledge, New York (2000)
2. Sowles, H.M.: Distributed knowledge in interior design: an emerging theory for the future of intelligent interior design. Doctoral dissertation, Washington State University (2016)
3. Rene, G., Mapes, D.: In the Spatial Web: How Web 3.0 Will Connect Humans, Machines, and AI to Transform the World (2019)
4. Hagen, R.J., Terpstra, G.A.: Perspectrum: A Human Eye Versus the Word, California State University Fresno, Fresno, CA (2020). www.sixhalfstudios.com/perspectrum