Extended Realities, Artificial Intelligence and Interfaces

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Abstract. Realities, Intelligences and Interfaces …. from Augmented, through Virtual, and Mixed; Artificial, Machine, and Natural …. technologies are here to stay and are investigated across disciplines. This contribution introduces studies and applications from various countries that are both creative and thought provoking to inspire and motivate readership and scholarship toward furthering this fast-advancing field.

Keywords: Experiences · Music · Audience · Play · Toys · Gamification · Design · Animation · Relations · Values

1 Introduction

1.1 Scope

The second section of this volume is themed - "Extended Realities, Artificial Intelligence and Interfaces" – the idea being to have focus upon these technologies relating across research topics associated to arts and technology, interactivity, and game creation perspectives.

The opening contribution in this second section is from Holland about social touch in public space of merging realities. The second contribution is on exploring relaxation experienced in virtual reality with a head mounted display versus experiencing via a television set. The third contribution focuses upon Virtual Reality scalable overlapping architectures and seamless teleportation of the user via innate virtual portals. The next topic is similar the previous but with a questioning of testers impression of associated environment's dimension. In the next contribution optimising virtual reality experiences in semi-public spaces such as museums and other exhibition venues is discussed. Subject of the next contribution is how sensors and actuators in smart urban environments can be configured in such a way that they initiate and facilitate playful and humorous events in real world situations. Semantics relating to Interaction alongside design and placement of touch gesture signifiers is in focus in the next contribution. The next contribution

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questions whether creativity can be supported or fostered by AI—not replaced. In the following contribution a Portuguese team questions method of authentication of paintings by various artists – fake or real! An experimental installation is discussed in the final research of this section, which informs of live artwork generation, artificial intelligence, and human interaction in a pedagogical environment.

The following text snippets elaborate directly from each contribution to further assist readership.

2 Hosting Social Touch in Public Space of Merging Realities

(Lancel et al. 2020)

A Dutch team comprising artists and academics shared their work under the title "Hosting social touch in public space of merging realities" – these are namely Karen Lancel, Hermen Maat, and Frances Brazier who ask if human hosting is essential to social touch in the public space of merging realities? This contribution explored in three experiments the role of hosting in art and design for mediating social touch in public space, social robotics, virtual reality and telematic environments.

The material informs on how the research purposefully disrupted and re-orchestrated multi-sensory connections in unfamiliar and unpredictable ways in order to evoke shared reflection and shared sense making in public, mediated by a host.

3 Renoir in VR: Comparing the Relaxation from Artworks Inside and Outside of Virtual Reality

(Kristensen et al. 2020)

This research by Johan Winther Kristensen, Lasse Lodberg Aafeldt, Peter Kejser Jensen, Rebecca Pipaluk Vinther, and Hendrik Knoche explored relaxation and artworks of natural beauty experienced in virtual reality with a head mounted display versus experiencing it via a television set. Reported outcomes inform how participants experienced this relaxation intervention after having finished a Montreal Imaging Stress Test and how all tested conditions relaxed people but no significant differences between them from neither subjective nor objective measures in a between subjects' study were found.

4 Procedurally Generated Self Overlapping Mazes in Virtual Reality

(Koltai et al. 2020)

Balázs Gyula Koltai, Jakob Elkjær Husted, Ronny Vangsted, Thomas Noes Mikkelsen, and Martin Kraus from Aalborg University next present the work "Procedurally Generated Self Overlapping Mazes in Virtual Reality" toward exploring a user experience of walking within a virtual reality environment that exceeds the size of the tracking area. Multiple approaches to overlapping architecture dealing with this issue already exist, but they are either custom made for a specific tracking area size or require a tracking area too large to work efficiently for personal use. This contribution

proposed a method to make scalable overlapping architecture by procedural generation of tile-based mazes that seamlessly teleport the user using portals.

The authors detail a convenience sample research conducted on twenty-three students in evaluating how the tile size of the overlapping maze affected the user's spatial awareness of their physical position.

5 Navigating Procedurally Generated Overt Self-overlapping Environments in VR

(Neerdal et al. 2020)

"Navigating procedurally generated overt self-overlapping environments in VR" is a research presented by Jannik Neerdal, Thomas Hansen, Nicolai Hansen, Kresta Louise Bonita, and Martin Kraus from Aalborg University City Campus, Aalborg, Denmark.

The content herein highlights how previous implementations of self-overlapping architecture tried to hide the characteristics of their non-Euclidean environment from users. To test the outcome of showing these characteristics to users, the authors inform how they proposed a virtual reality system with a play area of 3 m x 3 m and procedurally generated rooms that connected by portals. The aim of the portals was to provide seamless transitions between rooms and render overt self-overlapping architecture for players to experience. Participants were tasked with reporting their experiences and discoveries during the playthrough.

Based on this information and recordings of their view, the authors could determine whether they noticed any transitions. Additionally, the participants were asked specific questions regarding their experience with the overt self-overlapping environment, and how they interpreted the size of the virtual environment in relation to the physical one. The results showed that only 2 of the 20 participants who completed the full playthrough noticed any transitions, while each playthrough consisted of a minimum of 20 transitions. Therefore, it was concluded by the researchers that the transitions were experienced as being seamless. The system did not induce significant motion sickness in participants. Most participants felt good about navigating the overt self-overlapping environment, and the consensus was that the experience was strange, yet interesting.

6 Staging Virtual Reality Exhibits for Bystander Involvement in Semi-public Spaces

(Hepperle et al. 2020)

Daniel Hepperle, Andreas Siess, and Matthias Wölfel from the Faculty of Computer Science and Business Information Systems Karlsruhe University of Applied Sciences, Germany next present their research titled "Staging Virtual Reality Exhibits for Bystander Involvement in Semi-Public Spaces".

This contribution reflects how as virtual reality becomes more popular to be used in semi-public spaces such as museums and other exhibition venues, the question on how to optimally stage such an experience arises.

To foster interaction between participants and bystanders, to lower the primary threshold regarding participation and to moderate the transition between real and virtual

worlds the authors propose to augment a virtual hot-air balloon ride by a large-scale floor projection in addition to a physical basket and other extras.

Exhibited at a venue in Stuttgart, Germany a total of 140 participants evaluated the approach to inform the research. Conclusions confirmed how adding a floor projection helped to attract additional users as well as to increase overall user motivation on using the installation, and further how it led to establish a connection between the real and the virtual worlds for users.

7 Playful and Humorous Interactions in Urban Environments Made Possible with Augmented Reality Technology

(Nijholt 2020)

"Playful and Humorous Interactions in Urban Environments Made Possible with Augmented Reality Technology" is research by Dutchman Anton Nijholt who shares how there is more to humour than jokes: Humour can be created in jokes, in cartoons and animations, in products, commercials, and movies, or in stand-up comedy. However, also during our daily activities, we often smile and laugh because we experience interactions and events as humorous. We can experience such events; we can also initiate such events. Smart environments offer us tools that allow the customization of urban environments to potential and personalized playful and humorous experiences. The author informs how sensors and actuators in smart urban environments can be addressed and configured in such a way that they initiate and facilitate playful and humorous events in the real world, but it is also possible that without physical changes in the real world, our imaginations are triggered to give humorous interpretations of events in the real world by observing or imagining how they could be different. This work looks at humour that can be experienced by imagination, by suggestions, by changes in the environment, and by changing the environment using digital augmented and diminished reality tools. The views expressed here can help to add humour to urban play, urban games, and daily activities in public spaces using augmented reality technology.

8 "But Wait, There's More!" A Deeper Look into Temporally Placing Touch Gesture Signifiers

(Arleth et al. 2020)

Authors Liv Arleth, Emilie Lind Damkjær, and Hendrik Knoche consider signifiers and semantics from an Interaction Design position in their work "But Wait, There's More!" A Deeper Look into Temporally Placing Touch Gesture Signifiers. In this contribution the authors share how the language used in interaction design is affected by the wide array of academic backgrounds of interaction designers. Therefore, one word may have several meanings, which can be confusing when conducting research in this field. In this context their contribution defines three-levels of interaction: macro-, micro- and nanointeractions. The latter of these i.e. nanointeractions is the focus of the study. The authors' use Buxton's three state model to break down common gestures on touch interfaces into nanointeractions, thereby identifying where in the process of a gesture

its signifiers can appear. The authors posit the usefulness of this in respect of designing for controls in small interfaces. An experiment was conducted to determine whether the temporal placement of a signifier before, during, or after a gesture made any difference for the discoverability of a double and long tap affordance. No clear tendencies were found regarding the temporal placement of the signifier, however, the concept of nanointeractions is posited as being a valuable tool for interaction design.

9 Co-designing Object Shapes With Artificial Intelligence

(German et al. 2020)

A Germanic quartet of co-authors, namely Kevin German, Marco Limm, Matthias Wölfel, and Silke Helmerdig, present their research in their contribution titled "Co-Designing Object Shapes with Artificial Intelligence". The content discusses how the promise of artificial intelligence (AI), its latest developments in deep learning, has been influencing all kinds of disciplines such as in engineering, business, agriculture, and humanities. They note that more recently it also includes disciplines that were "reserved" to humans such as art and design. While there is a general debates ongoing questioning whether creativity is profoundly human, the authors in this work wanted to investigate if creativity can be supported or fostered by AI—not replaced. In line with this the contribution investigates if AI is capable of (a) inspiring designers by suggesting unexpected design variations, (b) learning the designer's taste or (c) being a co-creation partner. In their investigations the authors adopted AI algorithms, which can be trained by a small sample set of shapes of a given object, to propose novel shapes. The evaluation of their proposed methods revealed that it could be used by trained designers as well as non-designers to support the design process in different phases and that it could lead to novel designs not intended or foreseen by designers.

10 Authentication of Art: Assessing the Performance of a Machine Learning Based Authentication Method

(Chen et al. 2020)

In "Authentication of Art: assessing the performance of a machine learning based authentication method" the co-authors Ailin Chen, Rui Jesus and Márcia Vilarigues, all from Lisbon, Portugal, compared test results generated by applying their bespoke method in questioning authentication of paintings by Portuguese artist Amadeo de Souza Cardoso in the interest of exploring the generalisation properties of the implemented algorithm on other artists or genres. The foundation of establishing the baseline base for the method was shared to subsequently be improved and developed accordingly in future applications for a broader audience in a wider setting. Outcomes from the work show that the classifier obtained from the algorithm using paintings appears not to be directly applicable to drawings of the same artist: Also, when the classifier is retrained for a different genre like Chinese paintings or artists such as van Gogh, the algorithm appears to perform as well as the classifier on Amadeo paintings, thus, a conclusion being that the algorithm/method is sufficient for the classification of a specific type of artist or genre.

11 "What I See Is What You Get" Explorations of Live Artwork Generation, Artificial Intelligence, and Human Interaction in a Pedagogical Environment

(Herruzo and Pashenkov 2020)

"What I See Is What You Get" - Explorations of live artwork generation, artificial intelligence, and human interaction in a pedagogical environment is title of the research by co-authors Ana Herruzo and Nikita Pashenkov. This content reviews the overall process for the design, development, and deployment of "What I See Is What You Get", an experiential installation that creates live interactive visuals, by analysing human facial expressions and behaviours, accompanied by text generated using Machine Learning algorithms trained on the art collection of The J. Paul Getty Museum in Los Angeles. The project was developed by students and faculty in an academic environment and exhibited at the Getty Museum. The authors inform of their research of the pedagogical process implemented to address the curriculum's learning outcomes in an "applied" environment while designing a contemporary new media art piece. The contribution shares how special attention was paid to the level and quality of the interaction between users and the piece, demonstrating how advances in technology and computing such as Deep Learning and Natural Language Processing can contribute to deeper connections and new layers of interactivity.

Epilogue and Acknowledgements. This second section introduces ten contributions by extracting from each paper. It does so to promote readership of each full paper that are presented in the following chapters. In doing so the authors of this chapter acknowledge the contribution to this section/volume by each author whose original work was presented in the ArtsIT/DLI events in Aalborg, Denmark November 7–8, 2019.

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