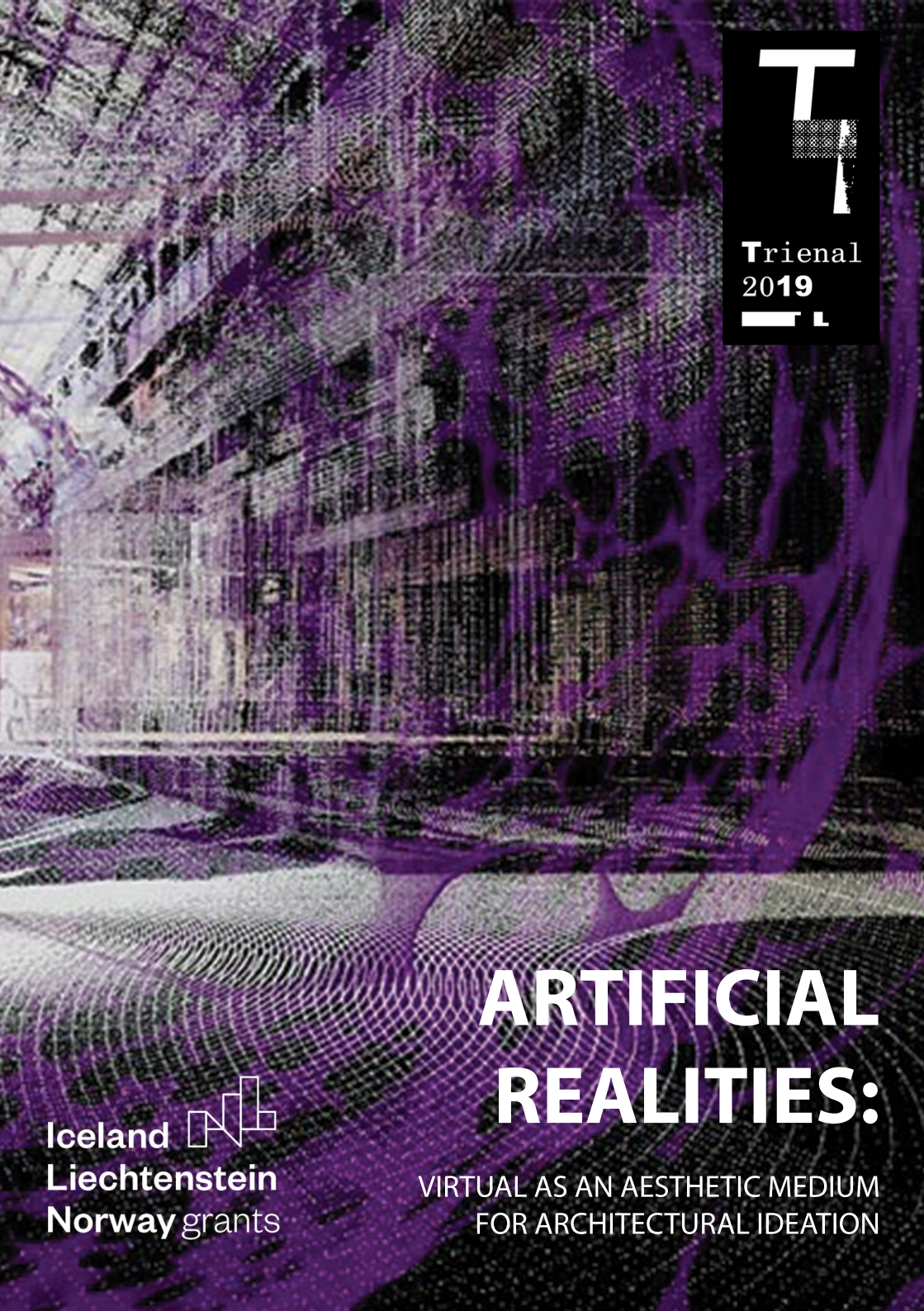

Trienal
2019

ARTIFICIAL REALITIES:

VIRTUAL AS AN AESTHETIC MEDIUM FOR ARCHITECTURAL IDEATION

Iceland
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Lisbon Architecture Triennale

The 5th edition of the Lisbon Architecture Triennale will be The Poetics of Reason. This title states that, for all its subjective and non-scientific dimension, architecture does rest on reason, and its aim is to shed light onto the specificity of this reason. Indeed, the fact that architecture is grounded into reason and rationality is key to its being understandable, i.e. shareable, by everyone, and not just by architects.

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organization

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Artificial Realities: Virtual as an Aesthetic Medium For Architectural Ideation

'Artificial Realities: Virtual as an Aesthetic Medium for architectural Ideation' is an associated project of Lisbon Architecture Triennale 2019. It is an exhibition coupled with a one-day symposium hosted and organized by ISTAR Information Sciences, Technology and Architecture Research Center, ISCTE-IUL in Lisbon.

The project is framed by the confrontation between rationality and efficiency related to virtual technologies applied to the architectural design process. The experience of the architectural space and the state of contemplation and delight of the architectonic exercise will have a digital materialization. Almost seventy years after the emergence of Virtual Reality (VR), we have witnessed a rapidly growing VR industry from a variety of fields (games, construction, education, healthcare, animation, filmmaking, art, computer science) to become key innovators in designing immersive experiences. However, VR as an aesthetic medium is still something relatively new. Although the technological side of VR has evolved rapidly, the aesthetic side of the medium has remained in a nascent stage. The event will explore the ways in which VR technologies can enable designers to expand their creative process. The event will trigger questions as: what are the specific techniques, methodologies and processes of the virtual craft in terms of creative process? How do contemporary VR projects explore the aesthetic potential of the medium? How are virtual technologies changing the way we design and create?

Cyber-Physical Experiences: Architecture as Interface

Turan Akman [STG Design] *and Ming Tang* [University of Cincinnati]

Abstract:

Conventionally, architects have relied on qualities of elements such as materiality, light, solids and voids, etc. to break out of the static nature of space and enhance the way users experience and perceive architecture. Even though some of these elements and methods helped create more dynamic spaces, architecture is still bound by conventional constraints of the discipline. With the introduction of technologies such as Augmented Reality (AR), it is becoming easier to blend digital, and physical realities, and create new types of spatial qualities and experiences, especially when it is combined with Virtual Reality (VR) early in the design process. Even though these emerging technologies cannot replace the primary and conventional qualitative elements in architecture, they can be used to supplement and enhance the experience and qualities architecture provides.

To explore how AR can enhance the way architecture is experienced and perceived, and how VR can be used to enhance the effects of these AR additions, the authors proposed a hybrid museum which integrated AR with conventional analog methods (e.g., materiality, light, etc.) to mediate spatial experiences. To evaluate the proposed space, the authors also created a VR walkthrough and collected quantifiable data on the spatial effects of these AR additions.

Keywords: Augmented Reality, Virtual Reality, Architecture, Spatial Experiences

Cyber-Physical Experiences: Architecture as Interface

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Abstract

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Introduction

Architecture exists in two domains simultaneously; “the reality of its tectonic and material construction, and the abstracted, idealized and spiritual dimensions of its artistic imagery.”(Pallasmaa, 2011) The first domain is physical, and serves architecture’s functionalities, thus objective. The latter domain is the one architects have relied on to mediate emotions, and enhance the way users experience and perceive architecture and space. However, because of the physical nature of architecture, some historians claimed that “architecture out of all arts has the most restrictive scale of emotions.”(Zevi and Barry, 1993) Throughout history, architects have tried many methods to achieve dynamic experiences in their designs, such as the addition of bays to make space feel more three dimensional in Byzantine architecture; the movement of the eyes upward in Gothic architecture; undulating surfaces in the Baroque period; and the geometrical patterns in the Islamic architecture. Moreover, projects like Fun Palace by Cedric Price experimented with different mechanical methods to make the space more dynamic, and allow the users to be the protagonists in the overall architectural and spatial experiences.

The Fun Palace project shows that as technology, materials, and construction techniques evolve, architects use what is available at the time, combined with what they learned from the previous times, and use it to their advantage to break out of the static nature of architecture, and enhance the way users experience and perceive their designs. However, a meaningful relationship of modern technology with architecture has been limited because of technology’s dependence on a virtual medium. Augmented reality(AR) on the other hand, uses the physical environment as its medium to project digital elements on to the real world, which makes it dependent on a physical environment, thus on architecture.

Since the digital elements are projected into the physical world, with correct materiality, lighting, and shadows, it makes it almost impossible to distinguish between digital additions and the physical reality. As

a result, new possibilities for architects emerge. Although AR technology is becoming an emerging tool for architects, the common elements architects have relied on, such as materiality, light, and shade, etc., should not be disregarded. AR should be carefully implemented, and exist in harmony with the rest of the architectural and spatial experiences, and enhance their qualities, but how do we test the AR additions without having the physical space built early in the design process? This is where virtual reality(VR) comes into play. VR became a powerful representation tool throughout the design process to test these AR effects in a simulated immersive environment. The physical architecture, along with the proposed interactive augmentations are tested through VR for user feedback since the early concept design stage. As Tang described the benefit of applying VR to simulate AR experience, "VR pipeline enabled design, exam, and modify the design while interacting with it. It became a fast cycle of refining and evaluation."(Tang, 2018)

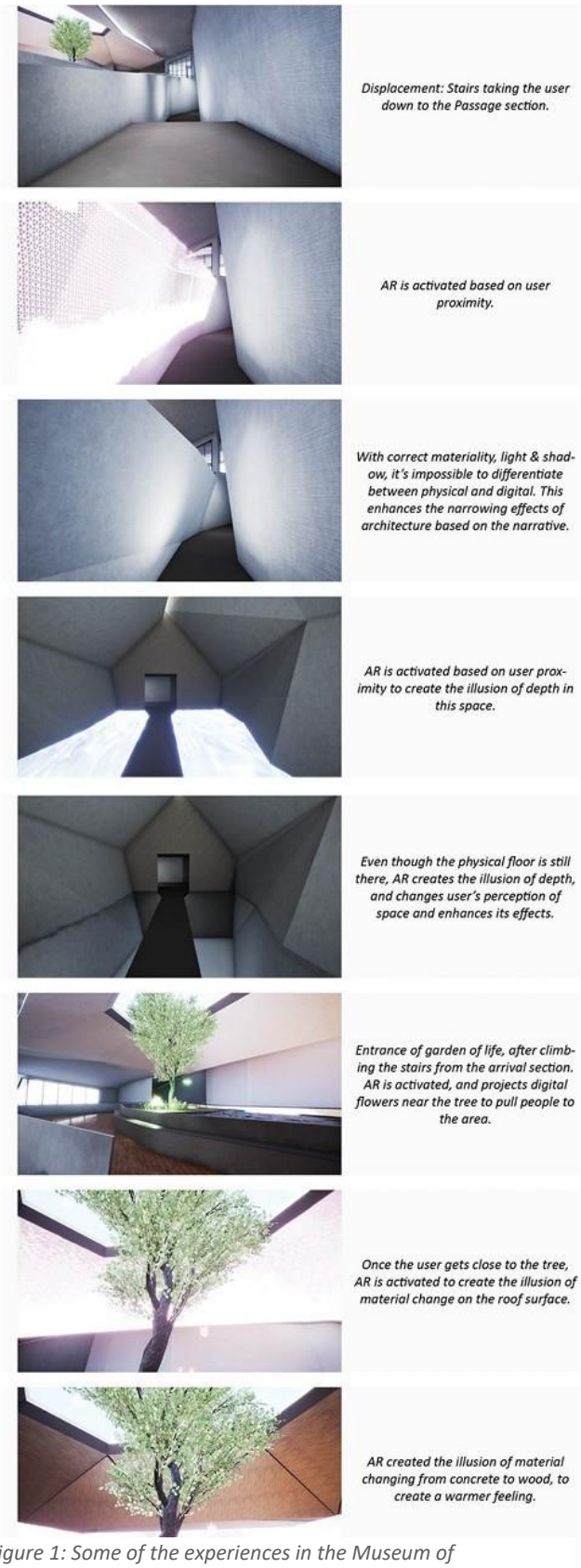


Figure 1: Some of the experiences in the Museum of Displacement

Although this paper does not go into the details of the museum design, it is essential to understand the design, and the narrative behind it, and how users were tested on, and evaluated with VR during the final evaluation process. The proposed AR museum is called "Museum of Displacement", which was proposed and designed as part of a Master of Architecture thesis in an academic context. The name of the museum is based on the general idea of displacement of a person. This displacement could be caused by many reasons, such as wars, need for food, natural disasters, or just looking for a better life. Even though the reasons might be different, usually they all have similar steps: *Home, Passage, Arrival*, and *Beyond Arrival*. *Home* would be where a person happily lives, and due to some reasons, there is a need for that person to displace to a new location. *Passage* would be the experiences through this moving process, usually the main struggles of a displacement. *Arrival* would be the experiences of arriving into a new place and would depict experiences of being lonely, and not knowing anyone, etc. Finally, the *Beyond Arrival* would be the happy place, when the displaced person is adopted to a new location/life and lives happily. The museum is divided into four major sections to experience these major points.(fig. 1) Once combined with conventional architectural elements, AR enhances the qualities of these elements, reinforces the users' experiences and how they perceive architecture, as well as creates a more immersive story-telling experience.

Moreover, the interactive experiences in these sections can be customized based on the local context, or the target audience.

Methods

In order to create powerful and compelling experiences, a refined version of a cyclical model of action research was used. While in the design process several test groups walked through the museum via a VR headset. Their reactions were observed, followed by a short questionnaire at the end. (fig. 2) With the help of this evaluation, the deficiencies of the design were found, and new iterations were created until the designer was happy with the outcome. For example, if a space in the museum is designed for a more emotional experience, upon the test of the user, the designer would observe the reaction of the user, and if the experience is not at the desired level, the design would be modified accordingly to enhance the overall experience. This process with VR eliminates the need to have the building construction completed to be able to test the proposed interactive digital additions. Moreover, a similar analysis was used to prove the impacts of AR. Reactions of the users were captured to study the whole spatial experiences. During this test, the first run provided only conventional architectural elements, without any additions of AR. This would be just the representation of physical building in a simulated VR environment. The second run would have the same elements combined with representation of interactive AR. As the reactions of the users are compared, enhancing qualities of AR in architecture can be proven.

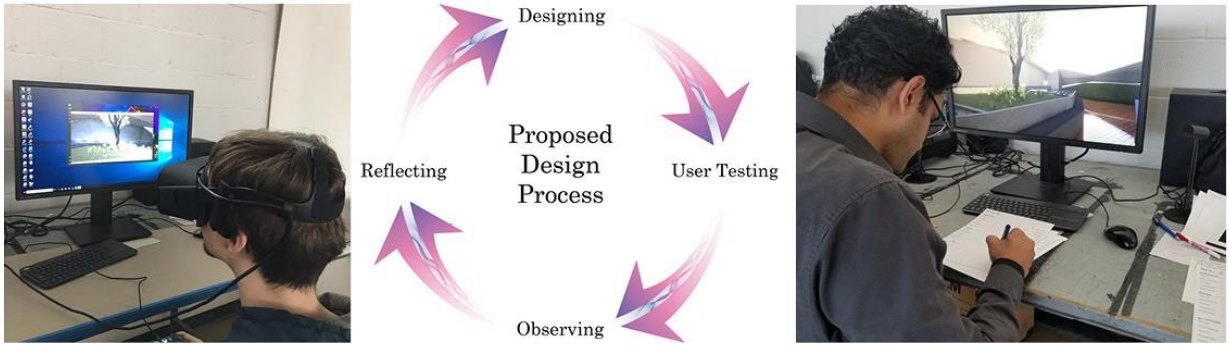


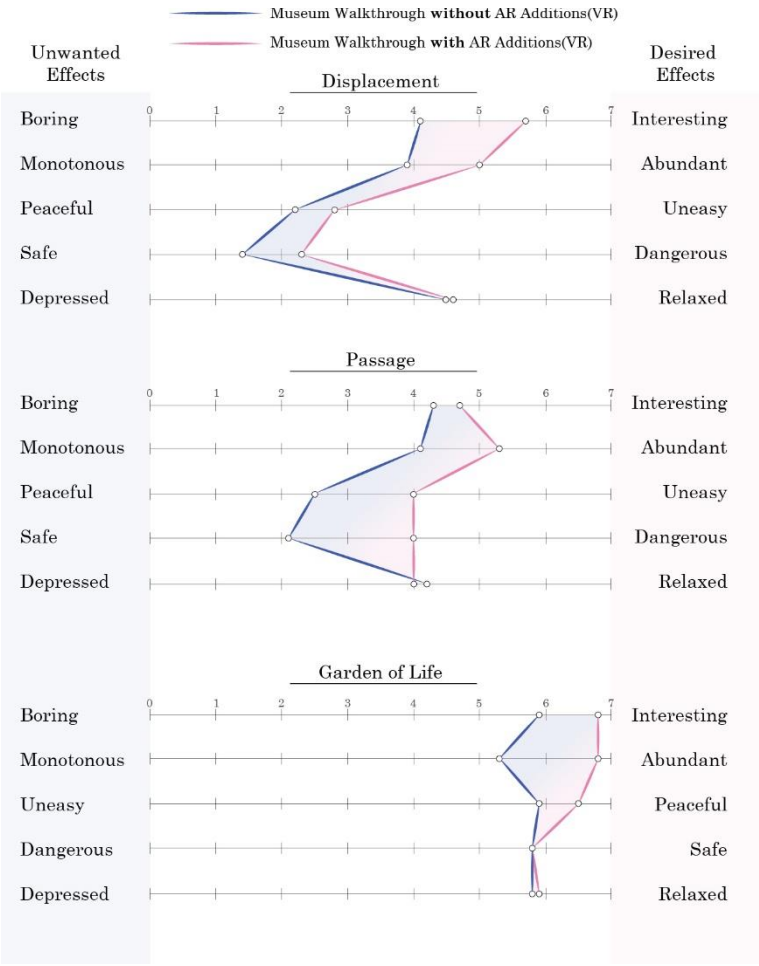
Figure 2: User testing phase at the University of Cincinnati. Photography and diagram by Turan Akman.

In order to initiate the first set of tests, and to get accurate results, a type of testing that would allow measuring spatial experiences quantitatively was developed. Semantic differential(SD) method was chosen. This method studies the psychological responses of people in space by giving them a 7-level scale with opposite words at the ends of the scale and asking them to rate their experiences. Although this method has many characteristics that could be tested on, five different characteristics were chosen and used based on the desired effects of AR, and the museum narrative; interestingness, richness, peace, safety, and depression. Each of these characteristics was measured by providing two extreme ends of the spectrum. For instance, interestingness was measured on a scale of one to seven, score one being “boring” and score seven being “interesting”. Moreover, throughout the test, not every negative word means an unwanted effect. Some negative words actually represent the desired effect. For example, “peace” is measured with the two extreme words of “uneasy” and “peaceful”. In some spaces of the museum where depicting the struggles of people, a nervous or an uneasy experience would be desired, so the negative word “uneasy” would be the desired answer from the users.

Findings

The first test was completed by ten architecture major students. Each student did a walk-through of the museum twice by using a VR headset, completely immersed in a virtual environment. The first VR run of the museum had experienced the conventional architectural elements only, without additions of the digital augmentation, as mentioned before, this VR scene just represents the physical part of the proposed

Table 1: Test results



museum. The second VR run had the conventional architectural elements combined with AR additions to enhance the qualities of these elements, and the overall experience of the space. The only variable in these two runs was the addition of AR. At the end of these two walk-through experiences, each person was asked to rate their experience for the first run, and the second run. These walk-through spaces included the hallway leading the user to the passage section called “displacement”, the passage, and finally the beyond arrival section, which is also called “garden of life”. The analysis showed that the physical architecture was not disregarded and still achieves part of the desired effects in the museum. However, additions of AR enhance the qualities and effects of the architecture.(table 1)

Discussion and Conclusion

Overall, the experiments clearly showed that blending digital elements with the physical world enhanced the qualities of the physical elements, and changed users’ perception of space. With the immersive qualities of VR, these tests were conducted as soon as there was a new iteration of the design. With the quantifiable data collected from the VR representations, the authors concluded that the interactive AR experiences can be designed simultaneously with the building design, which would enhance the qualities of both, and create a meaningful relationship between the physical and digital worlds.

The future phase of this research would be the comparison of the data coming from the VR tests, and real-world tests. Instead of running the user through the whole museum, small scale mock-up spaces can be built, with wearable AR devices to evaluate the user experience in real life.

Even though VR is a great tool to use during the design phase, some users had complaints of disorientation, and the bulky nature of the VR headsets was not comfortable for some users. Even though this might sound like a significant issue, the researchers believe that as technology improves, and AR/VR headsets get more streamlined ergonomically, these issues will be reduced.

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