Designing Immersive Art Installation Highlighting Culture using Spatial Augmented Reality: Case Study in Kuching, Malaysia

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Abstract: People have recently discussed Augmented Reality (AR) in art. In the present society, technological advancement has expanded the understanding and creation of art. Augmented Reality is not just limited to interacting using digital devices by the creators or viewers. It is also used as a non-interactive such as with the application of Spatial Augmented Reality. However, more research needs to be conducted on the potential and integration of Spatial Augmented Reality's role in art to promote culture. Based on previous observational studies and surveys among local youth, we proposed a design for art installation employing SAR. The aim was to present to local youth an immersive art as a case study that highlights local artistic motifs to seek its potential as a strategy to create an immersive art experience while promoting local culture. As a result, the study's findings are divided into two categories. First was the process of integrating SAR with an art installation that focused on local aesthetics. Second, the understanding of how SAR-based impact on spectators' experience.

Keywords: spatial augmented reality, immersive art, culture

1. INTRODUCTION

Research on Augmented Reality (AR) has recently increased globally. Inventive computer-generated content is displayed physically via augmented reality technology to attract users or audiences [1]. Yet still, Spatial Augmented Reality has yet to be much researched in the literature, especially in the arts field. Its ability to create immersive environments needs further studies. It also needs more attention and research studies to understand how SAR technology can create immersive environments that benefit the art experience.

Due to technological and entertainment industry advancements, the younger generations of a community are becoming more engaged in the trend of technology-based integration in arts [2]. Each perception of a community's sense of identity may reflect the arts and cultures of that community, which over such a long time, have built a sense of love and pride for the place they call home [3]. However, as they have grown up with technology, their curiosity and wonder are more focused on western culture and fit into what is now primarily associated with the development and presentation of technology. Attracting youngsters' attention to appreciating local arts and culture may take time [4].

Therefore, this paper aimed to design an immersive art installation adopting Spatial Augmented Reality (SAR) to seek its potential in the local arts and promote regional culture as a case study in Kuching, Malaysia. Lack of technological experimentation, integration, and exposure among young local creators and artists in Kuching may cause them to overlook the possibility of something unique while emphasising the significance of incorporating local cultural value into the new perspective of artistic creation and presentation in the modern era. While it has been utilised extensively in the entertainment business, it has garnered little attention in the art and culture scene, particularly in the cultural heritage of this region. Despite its great potential, Spatial Augmented Reality application still needs to be more prominent in the creative world, notably in Malaysia [5].

2. RESEARCH FOCUS

This study seeks to address practical process regarding the use of SAR in the art practice to emphasise local culture so that the technology becomes a topic of discussion among professionals thus that we may use it as a tool and expand our field.

This study aims to explore the potential and limits of SAR-based artwork as an interpretative way of supporting traditional arts in a new medium of presentation. The outcome of this research will guide local practitioners on using SAR as part of their interpretive tools to express the local or cultural heritage stories and arts uniquely and effectively to attract new audiences, primarily the younger generations.

Therefore, the study proposed an immersive design of art installation promoting local culture using Spatial Augmented Reality with the installation art approach. It hoped to serve as a guideline for local creators and researchers exploring immersive arts. The design focused on achieving immersive space that could be experienced by the spectators through the manipulation of audio and visual materials presented to the audience.

3. RELATED WORK

The Spatial Augmented Reality (SAR) application, also known as projection-based AR or 3D projection mapping, is an effective method for establishing an immersive environment. According to [6] the augmented reality (AR) community defines SAR as the use of projection technology to supplement any 3D objects and spaces in the real world via

image projections onto visible surfaces. The virtual content is projected onto actual physical things to create spatial augmented reality or SAR settings. Viewers do not need to wear gadgets to watch the virtual content or experience the illusions it produces [7].

4. METHOD

The application design is built to comprehend the specification for creating an immersive art display employing SAR application and space interaction. The design procedure in this study is divided into two steps: developing the architecture diagram and deciding the immersive model amongst viewers. The architecture diagram depicts elements and their relationships to provide an immersive art installation concept via the SAR application. Details concerning the work's experience with the audience are also discussed.

This study employs three parts. Documentary research is the study or review of the literature through research articles, and related papers to gain specific insights and information that focuses primarily on the technical and theoretical aspects that could lead to the development of an art installation concept with SAR integration. As part of a field study, after presenting the art installation in a local gallery, a questionnaire was distributed to visitors to measure their reactions to the research outcome. As a final phase, we observed the production of the artwork and the visitor's engagement with the art installation.

5. DISCUSSION

5.1 Architecture Diagram

The architecture diagram is a graphical representation to describe componenets and the relation between components that are used to present body of work to spectators (see figure.1).
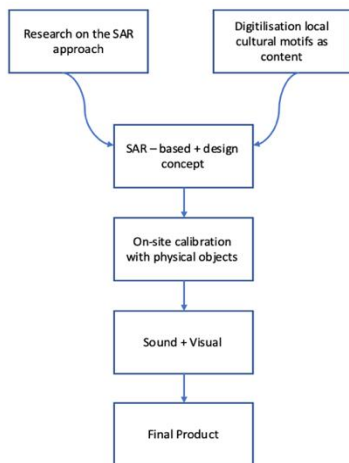

Figure. 1 Design Process Architecture flow

Based on figure 1 there are two important components required to create SAR-based art installation to allow spectators experience the work in an immersive space, which are sound and visual. According to Salselas, sound can capture and focus spatial or audiovisual attention as a persuasive element [8]. Oh & Kong suggested in their findings

that combining animation content with emotional attachment and VR attractions will allow visitors to experience stronger emotional connection, enhanced presence, and deeper immersion [9]. In this final product output, we complemented the animated visual with an instrumental sound design as the emotional element.

SAR integration into an artwork is designed to create an immersive artistic display that allows the audience to experience a real-time mixing of virtual content and real objects. Multimedia materials such as sound, moving images and animation support and enhance the experience and the aesthetic of the artwork supported by technology. SAR offers more than just an immersive environment; however, extensive exploration and experimentation may be needed to understand how it can create a dynamic interactivity between the artwork, space, and spectators.
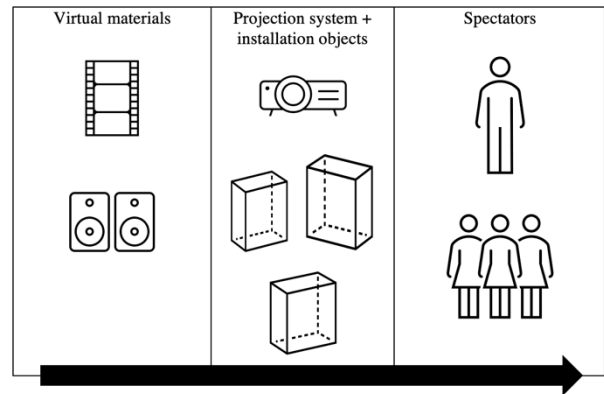

Figure. 2 Layout of the SAR-based installation setup in a gallery space.

5.2 System Layout

Figure. 2 above shows the layout system for the proposed SAR-based installation art in a gallery space. It requires three different components:

5.2.1. Virtual Materials

It includes audio and visual materials, which were edited to be synchronised in terms of musical rhythm and image motion. As it operates in harmony, a moving image accompanied by sound may enhance the spectator's overall art experience. Harvey et al. (1998) demonstrated in their research study that using sounds apart from haptic and smells to complement the art object, and dynamic displays can significantly impact visitors' experiences [10]. It is obvious sound could be a powerful element to guide spectators's emotion.

5.2.2. Projection system and Installation objects

A projection equipment is required for this SAR-based installation to project the virtual pictures onto actual white objects as the projection canvas. Through this setup, the virtual materials are viewed beyond the monitor screen, and the spectator can view the content on physical installation pieces served as the projection canvas. This was accomplished with the use of spatial augmented reality software. In this research study, we utilized a software called Madmapper, which allows us to manipulate virtual content on any shape of the physical item.

5.2.3. Spectators.

Through the installation art approach setup, the spectators can view the art with a projection of moving images

onto it – this creates an immersive audiovisual phenomenon. Through the SAR- system, the spectator's viewing method is not limited to headgear or mobile device to view the virtual content; therefore, it allows for viewing more than one person at a time. Most importantly, it imitates a gallery space where spectators have freedom while viewing the artworks without limiting themselves by looking through VR or AR devices.

5.3 Exhibiting SAR-based Art Installation

The SAR-based installation was exhibited in a dark gallery room to optimize the digital projection effects. It comprises seven soft materials attached from ceiling to floor inside the gallery. The virtual imagery and content were based on the regional cultural design motifs in Kuching (see figure.3). We installed the actual artefacts mounted apart from one another so that spectators may walk in and around the installation area following installation arts criteria. As seen in the figure. 4, the actual objects serve as a projection canvas for the virtual content.
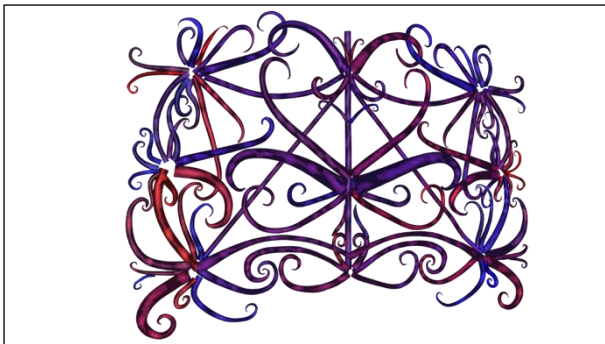

Figure. 3 Digitilisation of traditional art motifs into 3d animated images

Figure. 4 A spectator observing the moving images projected onto the soft materials during the exhibition.

During the exhibition, we installed a floral scent at the installation entrance to arouse a natural sense and feeling. It was intended to enhance the spectator's experience and be immersed in the work presented. It was established that aroma could affect mood, making it an essential element in experience creation [11]. In the background, music with minimal instruments comprised of nature soundscapes plays. The acoustic settings and flowery scent are intended to soothe the audience while activating their senses and emotions and immersing them in the spatial artwork. The installation is intended to engage visitors' auditory and touch senses to create an immersive environment and space [12].

5.4 Spectators Experience

The findings demonstrate the audience's recognition of this exhibition's intention, which resulted in the audience feeling engaged and immersed in the experience. Through our survey of spectators, the installation design setup with the SAR application makes them feel surreal and like they are in a dream, which fits with the project's intention to immerse the audience in the spatial-based art installation supported by technology. Some responded that the SAR installation creates an immersive environment and reminds them of real rainforests as the audio and visual design and installation conceptualized a minimal forest-like. Through researchers' observation of the spectators, they enjoyed and engaged in the environment and were immersed in the spatial artwork that some of them spent quite some time observing the work.

The study found that SAR-based technology allows for an immersive experience due to its spatial quality [13]. However, the audio and visual content guides the overall experience, especially the emotional elements. Interviews conducted by Oh & Kong (2021) revealed that adopting new technologies only generates one-time visits. Tourists prefer rich, emotionally compelling content over simply possessing cutting-edge VR technology when experiencing attractions. Therefore, highlighting one's culture and identity play essential concept elements to attract and connect spectators with the artworks.

6. CONCLUSION

This study showed that SAR-based art exhibitions fit today's art galleries and museums, promoting local cultural heritage for immersive experiences and are technologically current. As other fields adapt to new technologies, so should the arts. This research aligns with intending to create contemporary art that highlights local culture in innovative ways. As for this case study, SAR-based artworks could emerge as the new standard in Kuching.

In summary, the proposed architecture flow can be used to build a spatial-augmented reality art display. Incorporating local content will enhance and create an emotional attachment to the artwork among the spectators. However, the interaction between the artwork and the viewers is still limited using the basic layout. A prototype application combining interaction study could be needed to replicate a dynamic SAR-based designed artwork in future research. Therefore, evaluating the SAR application's performance when creating interactive elements is advised to improve the immersive art experience.

7. ACKNOWLEDGMENTS

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