

# Development and Implementation of Projection-Based Installation in Gallery Space and Visitors Experience



Auzani Zeda Mohamed Kassim, Hasnizam Abdul Wahid, Muhyiddin Mohammed

**Abstract:** In this paper, we present a projection-based installation designed for gallery-based exhibition. The installation system based on the Spatial Augmented Reality or known as "SAR," in which digital images were projected onto real objects or materials using projectors such as projection mapping techniques. This project studied the use of digital technology for gallery exhibition installation works to enrich and create an engaging audience's art experience through an immersive space created through SAR application. The study involved 79 youth who responded about their experience after viewing the projection-based installation work through a questionnaire survey. The findings show that the use of digital technology to the installation creates dreamlike scenes, imitating nature ambience complemented with visuals and sound and well provides immersive experience among the visitors through the mixing of virtual images with real objects. The significance of this research on SAR application in exhibition artworks is essential to understand how it affects the audience's experience. The results are necessary as contributions for the development of innovative art mediums intended for gallery-based exhibitions and visitors' engagement, mainly targeted among the youth as the modern audience.

**Keywords :** projection-based installation, Spatial Augmented Reality, immersive experience, gallery exhibition

## I. INTRODUCTION

Spatial Augmented Reality, or known as SAR environments, is achieved when virtual content projects onto real physical objects. It does not require viewers to wear devices to view the virtual content or to experience the illusions it created. The SAR application, also sometimes referred to as projection-based AR or 3D projection mapping, appears to be a suitable strategy to create an immersive environment in gallery space to enrich audience art experience when viewing exhibited artworks [1].

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Results from this, the real-world objects' appearance will alter in many different ways according to the projected virtual images[2]. It can be in the form of animation, live videos, or still-images play in sequences. There have been many projects that used SAR to augment physical objects with additional information, but not many studies on visitors' experience highlighted. Therefore the focus of this paper is to study how projection-based exhibition work may influence visitors' experience. The aimed is to seek it's potential to stimulate the audience and influence them to feel immersed with the environment created from mixing both the virtual images and the real objects. The immersive spaces created with the presence of visuals, sound, and light may engage the audiences' perceptions into temporal illusions of alternative virtual worlds[1]. For this purpose, we designed a projection-based installation, which then we exhibited to a group of audience and evaluated their experience through the questionnaire method.

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## II. INSTALLATION DESIGN

### A. Motivation

In Sarawak, Malaysia, exhibitions mostly relied on visual content to explain art and objects where the spectators or visitors mostly familiar with traditionally looking. However, as the growing use of technologies in arts, it changes and enables opportunities in the way we experience art. Thus, local artists may adapt to these recent trends to create memorable exhibition artworks that fit with the current demand from the modern audience to experience art in a new way.

### B. Design Concept

Nature floral inspires the visual installation concept. We wanted to bring the nature world presence and feels into the gallery space. Regard to this intention, we choose to use SAR to create a dream-like environment by combining both virtual and real together. This combination allowed the audiences to identify visually extended space through a virtual image projection in which the method can advantage to improve their immersion with the artwork [4]. The purpose is to transport visitors into an imaginative world of nature, where we tried to highlight on multisensory of touch, hear, physical contact, and smell.

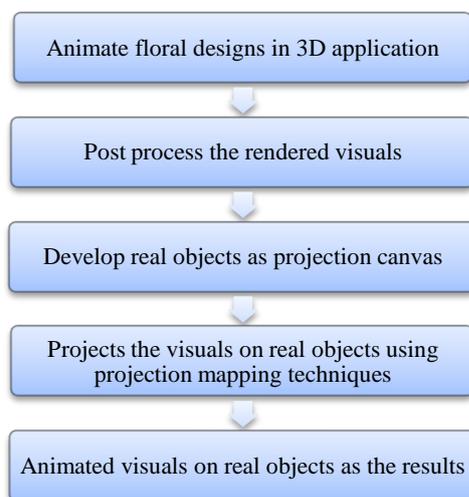
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## C. Implementation

The installation's system is mainly composed of a computer, a projector, and a speaker system. The specifications of the devices shown in Table I. We use Autodesk Maya, an animation software to construct the visual images and Adobe After Effects, a post-production software for visual post-processing into the desired images look and feel. We mapped the visual images onto real objects by using Madmapper, a projection mapping software. The flow of the execution process shown in "Fig. 1" below.

**Table- I: System Components**

|           |            |                        |
|-----------|------------|------------------------|
| Computer  | Model      | Apple MacPro Late 2013 |
|           | CPU        | 2.3 GHz Intel Core i7  |
|           | RAM        | 8 GB                   |
|           | Graphics   | Intel Iris Pro 1536 MB |
| Projector | Model      | Epson EB-X41 XGA 3LCD  |
|           | Brightness | 3600 Lumens            |
|           | Resolution | 1152 x 864             |



**Fig. 1. Installation's architecture flow**

## D. Exhibition Overview

We exhibited the installation work at an event held at the Gallery of Faculty of Applied and Creative Arts, Universiti Malaysia Sarawak, Malaysia. It was displayed to visitors from 9:00 to 15:00 on October 9th, 2019. Total attendance reached nearly 130 visitors.

The projection-based installation was exhibited in a total dark gallery room to achieve maximum digital projection effects. It consists of 7 real materials attached from ceiling to floor inside the gallery space. We installed the real objects mounted away from each other to enable the visitors to walk in and around the installation area - befitting with the usual installation arts criteria. The physical objects act as the projection canvas for the virtual content, as shown in "fig.2".

In the exhibition's design, we installed a floral fragrance at the installation entrance to create a nature-sense. It proved that scent actually can impact mood, which makes it an essential feature in the creation of experience [3]. Music of minimal instruments composed of nature soundscape play in the background. The hope is that audio settings and the smell

of floral can help relax the audience, therefore, arouse their senses and emotion and transport them into the exhibition environment. The installation designed to gives the visitors to experience the artwork not just see but also engage them through hear and touch senses to reach an immersive environment and space [5].



**Fig. 2. A visitor explores the projection-based artwork exhibition.**

## III. METHOD

### A. Procedure

This study involved 1 (HEI) Higher Education Institution located in Sarawak, Malaysia. The youths participated in the test, totaling 79 respondents ages 21-25 years with arts and design background, mainly majoring in animation and graphic design. They were male and female among visitors and participants from demographic profiles based on different races in Malaysia and interested in art exhibitions.

### B. Questionnaire Design

We conducted a questionnaire survey to the participants to verify the effectiveness of the projection-based installation exhibited in a gallery setting and how they felt during the experience. The questionnaire conducted on a five-point Likert scale "Strongly Disagree", "Disagree", "Neutral", "Agree", "Strongly Agree".

## IV. RESULTS AND DISCUSSION

The analysis and processes were performed using SPSS. Questionnaires were conducted after the visitor's view and experience the installation with a total response of n=79 through an online social website.

"Fig. 3" shows the result of visitor's familiarity with projection-based exhibition works. It indicates that 75.9% of the respondents had never visited nor experience projection-based artworks in a gallery before and 12.7% not sure if they visited the kind of exhibition before, followed by only 11.4% had experience projection-based artworks. This result may be due to projection-based installation or projection mapping artworks relatively still new in Malaysia.

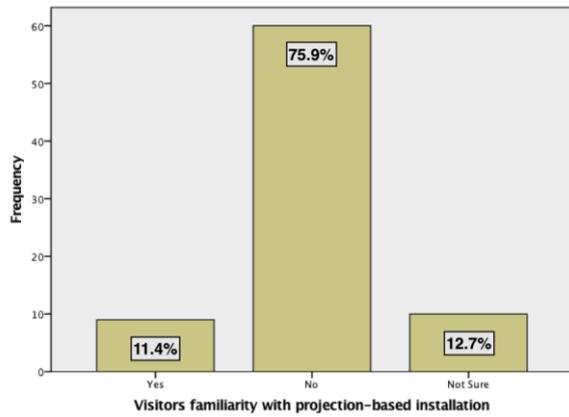


Fig. 3.Visitors' projection-based exhibition familiarity chart

A. Visitor Experience

The results show (Table 2) most audiences feel that the application of SAR that mix both virtual images and real cloth sculptures is stimulating and enhance their experience where both agree and strongly agree are the highest percentage of 39.2% totaling in 78.4 %. These results demonstrate the audience's recognition of this exhibition's intention, which resulted in the audience to feel engaged and immersed in the experience as 38% (Table 3) strongly agree with the statement, followed by 36.7 % agree with them too. 45.6% (Table 4) acknowledges that SAR visual installation artwork creates a stimulating atmosphere, which makes them feel surreal and like in a dream, which fitted with the project intends to make the audience feel transported into an imaginary world. 35.4% strongly agree, and 34.2% agree (Table 5) that the projection-based installation creates an immersive environment and reminds them of real forests ambiance – which the results strengthen the hypothesis of the project.

The exhibition has achieved its objective by 53.2% of the respondents strongly agree that the work made them want to know more about what they are seeing. The result indicates projection-based artwork, not just make the audience felt immersed in the environment but also makes the audience felt connected with the story and theme highlighted in the artwork. It indicates that projection-based exhibitions are also suitable for educational purposes that can highlight critical issues such as climate change and not just for art's sake. 45.6% (table 7) agree that the style of installation felt relevant for a modern audience, mainly younger or internet generations.

The results shows (Table 3), which uses correlation analysis, shows significant value of virtual projections onto real objects stimulates audience experience, and the audience felt immersed in the experience with a significant value less than .001. Therefore, the results show a connection of (.539) for projection-based create immersive experience among visitors.

The results demonstrate that, overall, the application of SAR or projection-based installation to create immersive gallery space and experience among visitors was a success.

To sum up the statistical results, this project takes advantage of digital technology in seeking new installation display in gallery space. The strategy of adopting a projection system

serves the younger generation's interest in new things. Thus enrich their experience in a gallery-based exhibition that recently appears a challenge for traditional display.

Table- II: The mix of virtual projection and real objects is stimulating and deepens the experience

|                | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------|-----------|---------|---------------|--------------------|
| Disagree       | 3         | 3.8     | 3.8           | 3.8                |
| Neutral        | 14        | 17.7    | 17.7          | 21.5               |
| Agree          | 31        | 39.2    | 39.2          | 60.8               |
| Strongly Agree | 31        | 39.2    | 39.2          | 100.0              |
| Total          | 79        | 100.0   | 100.0         |                    |

Table- III: I felt engaged and immersed in the experience

|                   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Strongly Disagree | 1         | 1.3     | 1.3           | 1.3                |
| Disagree          | 4         | 5.1     | 5.1           | 6.3                |
| Neutral           | 15        | 19.0    | 19.0          | 25.3               |
| Agree             | 29        | 36.7    | 36.7          | 62.0               |
| Strongly Agree    | 30        | 38.0    | 38.0          | 100.0              |
| Total             | 79        | 100.0   | 100.0         |                    |

Table- IV: The artwork makes me feel surreal or like in a dream.

|                   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Strongly Disagree | 2         | 2.5     | 2.5           | 2.5                |
| Disagree          | 1         | 1.3     | 1.3           | 3.8                |
| Neutral           | 13        | 16.5    | 16.5          | 20.3               |
| Agree             | 27        | 34.2    | 34.2          | 54.4               |
| Strongly Agree    | 36        | 45.6    | 45.6          | 100.0              |
| Total             | 79        | 100.0   | 100.0         |                    |

Table- V: The projection-based installation create immersive environment and reminds me of real forests ambiance.

|                   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Strongly Disagree | 1         | 1.3     | 1.3           | 1.3                |
| Disagree          | 6         | 7.6     | 7.6           | 8.9                |
| Neutral           | 17        | 21.5    | 21.5          | 30.4               |
| Agree             | 27        | 34.2    | 34.2          | 64.6               |
| Strongly Agree    | 28        | 35.4    | 35.4          | 100.0              |
| Total             | 79        | 100.0   | 100.0         |                    |

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**Table- VI: It made me want to know more about what I was seeing**

|                       | Frequency | Percent     | Valid Percent | Cumulative Percent |
|-----------------------|-----------|-------------|---------------|--------------------|
| Strongly Disagree     | 2         | 2.5         | 2.5           | 2.5                |
| Disagree              | 1         | 1.3         | 1.3           | 3.8                |
| Neutral               | 11        | 13.9        | 13.9          | 17.7               |
| Agree                 | 23        | 29.1        | 29.1          | 46.8               |
| <b>Strongly Agree</b> | <b>42</b> | <b>53.2</b> | <b>53.2</b>   | <b>100.0</b>       |
| Total                 | 79        | 100.0       | 100.0         |                    |

**Table- VII: This style of installation felt related for modern audience or visitors**

|                   | Frequency | Percent     | Valid Percent | Cumulative Percent |
|-------------------|-----------|-------------|---------------|--------------------|
| Strongly Disagree | 2         | 2.5         | 2.5           | 2.5                |
| Neutral           | 16        | 20.3        | 20.3          | 22.8               |
| <b>Agree</b>      | <b>36</b> | <b>45.6</b> | <b>45.6</b>   | <b>68.4</b>        |
| Strongly Agree    | 25        | 31.6        | 31.6          | 100.0              |
| Total             | 79        | 100.0       | 100.0         |                    |

**Table- VIII: Correlation results and significant value of projection-based installation ad visitors' experience. \*\*. Correlation is significant at the 0.01 level (2-tailed).**

|  |                         | Virtual projections onto real objects is stimulating and deepens my experience | I felt engaged and immersed in the experience |
|--|-------------------------|--|---|
| Virtual projections onto real objects is stimulating and deepens my experience | Correlation Coefficient | 1.000  | .539**  |
|  | Sig. (2-tailed)         | .  | .000  |
|  | N                       | 79   | 79  |
| I felt engaged and immersed in the experience                                  | Correlation Coefficient | .539**   | 1.000   |
|  | Sig. (2-tailed)         | .000   | .   |
|  | N                       | 79   | 79  |

## V. CONCLUSION

Interestingly, based on the overview of visitors' experience analysis of the projection-based installation, it is evident that this type of artwork exhibit in a gallery has much creative potential and relevant in the current art displays. The findings suggested the use of a projector to the installation creates surreal scenes, mimicking nature atmosphere complemented with virtual effects and sound and provides immersive experience among the visitors through the merges of virtual images onto the real objects. The SAR application conveyed

the possibilities of future gallery-based artworks and established in creating immersive and memorable experiences among the audiences. This study has indicated that this exhibition is significantly suitable for the younger generation and matches to the project objectives. The use of the SAR application mix with conventional artworks could be the innovative tools for local artists in Sarawak to expand their artworks in providing rich art experiences to the audience.

Particularly, with the extensive improvements in digital technology and projection system that are accessible to the public, projection-based artworks are evident to be the new mainstream. This study hoped it would somehow affect the art scene in Malaysia in the future.

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The projection-based installation artwork presented in this paper designed and created by Auzani Zeda Mohamed Kassim.

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As a scholar and among early electroacoustic composers in Malaysia, he plays a key role in introducing electroacoustics in Malaysia. He has participated in various national and international festivals as well as competitions such as Bourges (France), Emphirical Soundings (Australia), Musicacoustica (China), Asea(r)n (Thailand) as well as Spectre (Malaysia).  
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