

Preliminary Development of Virtual Reality for Batik Exhibition

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ABSTRACT

— In response to the COVID-19 pandemic, the government cancelled art and cultural activities to prevent the spread of the virus. This condition is troublesome for batik artisans because it forces them to close their door from visitors. This research intends to design an application that can be an alternative medium for the craftsman to reach their market using Virtual Reality technology. The application will provide an exhibition area include several booths with the property for batik display. Admin and batik artisans can choose a booth to make modifications such as uploading batik textures and input information about booth title and batik information. Visitors can navigate through the exhibition area and interact with the virtual world to learn and gain information and story behind the batik pattern. Through this paper, we present the preliminary progress of developing the Virtual Reality for batik exhibition

Keywords

Batik; Cultural Heritage; Exhibition; Virtual Reality

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Introduction

Batik is known as Indonesian cultural heritage that has received recognition from UNESCO on 2 October 2009. Cultural Sector of the UNESCO gives a task to all Member States, including Indonesia, to protect and promote their cultural diversity by taking measures that include the protection, restoration and safety of cultural heritage [1]. Batik Industry is one of the creative industry that has contributed to gross domestic product (GDP) of Indonesia reached Rp255,45 trillion in 2019. Batik industry is dominated by small and medium size industries, which are spread across 101 cities in Indonesia, with a total of 47 thousand business unity and absorbed employments more than 200 thousand people [2].

The recent pandemic is threatening creative batik industry, especially in production and marketing. One of the marketing processes for the batik industry is through batik exhibitions. The government cancelled art and cultural activities to prevent the spread of Covid-19 [3]. Batik industry has to try surviving this pandemic condition by producing products that can be wear as simple personal protective equipment (PPE) such as a mask. The Ministry of Industry through the Centre of Handicrafts and Batik in Yogyakarta organizes public online classes to teach industry on how to produce masks for the community [4].

The use of Virtual Reality (VR) has grown significantly, entering many different aspects of our lives. Recently in pandemic time, such technologies also entered the museum sector, affecting the way people experience and perceive heritage [5-7]. VR has been used for reconstructing historical environments [8], for interpretation and experience enhancement [9,10], for increased visitor engagement and education [11], and for creating interactive, engaging, and immersive experiences in museum

environments [12]. Virtual medium gives art artisans opportunity to show their creation.

Recently in Indonesia, two exhibitions organized by Gudskul “Di Rumah Tak Berarti Melemah” and “MereTas Batas” were held virtually using web-based virtual tour [13]. In other studies [14-16], using games is proven to be effective in providing insight and interest in children to learn about traditional batik.

We begin this research by studying data in the form of information and digital images of batik textures and then modelling 3D objects that will form the exhibition space. A virtual exhibition space will be developed using a game engine with lighting and rendering settings to build a realistic exhibition atmosphere. This is necessary because it can affect the level of immersion and engagement. Indeed, it has been acknowledged in the relevant literature that the level of graphic realism can influence the level of virtual presence perceived by users [17]. The next phase is the development of interaction, control, and delivery of information about the exhibition area to users. Also, with the decal technique creating playful interactions for customize dress using batik texture. VR technology presents various creative elements that provide many opportunities for the media to become a useful learning tool [18].

This research aims to create an interactive virtual batik exhibition platform with centralized data. Hoped this virtual platform could become an alternative medium for batik artisans to show and display their works.

Related Works

This section will discuss the related works that focus on virtual application medium for cultural heritage.

A. Virtue

VIRTUE is a VR application that provides users with a virtual museum experience. In this application, users can feel like be in the museum and enjoy the artefacts in it. In this

application have two types of user: visitor and admin/manager that will be given different access to the system [19].

This VR system has integrated with the database, so if there's a new object that needs to display to the museum, can be done automatically on the back-end, which can be directly updated in the VR application. This is also very helpful for developers where they don't have to go back to compiling and exporting application when they want to insert new objects.

Visitors will only be able to see the contents of the museum, without being able to change the layout of the virtual museum. However, admin or manager on the back-end of this app can change the contents of the museum by adding assets in the database, adjusting the texture on the museum walls, lighting the museum, and arranging assets in the museum. The appearance of VIRTUE can be seen in Fig. 1.



Fig. 1 Museum Room in Virtue Application

Unfortunately, VIRTUE cannot automatically place artefacts within the room, e.g., based on the visual or semantic similarity of artefacts. It needs to be done by accessing the back-end of the application.

B. Immersive Digital Heritage Site/ Museum Experiences: The Hidden Waterfall City

The Hidden Waterfall City (HWC) is a digital concept of historical sites. The purpose of this research is to create a virtual area on a large scale. The concept of a village that is located in the mountains; the design is done using a Terrain Engine [20].

User can explore the virtual area by teleporting with VR tool control. The information displayed in the form of writing on wooden objects or 3D boards. Currently, the system is still in the 3D modelling and control stages and does not yet have detailed information about the virtual area itself. In general, the application of historical sites using VR is very attractive to users. Fig. 2 shows a part of HWC.

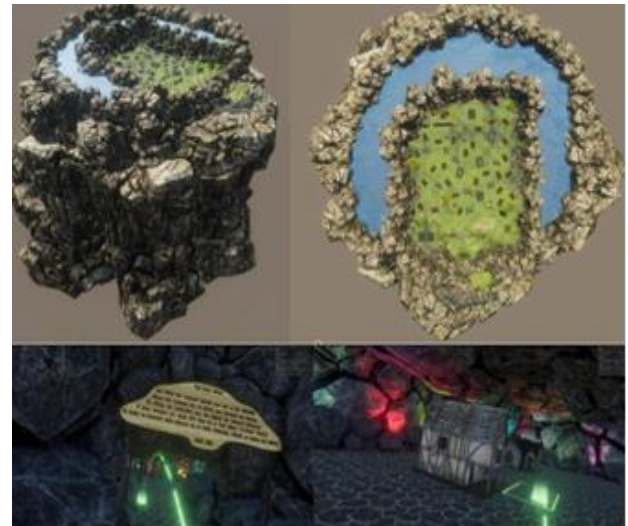


Fig. 2 The Hidden Waterfall City

C. V-Museum: A Virtual Museum Based on Augmented and Virtual Realities for Cultural Heritage Mediation

V-Museum is a virtual museum application that is created through a combination of augmented and virtual reality with a mobile device. Mixing the two technologies will allow the user to move with ease from the physical reality of the site, enriched with a few virtual artefacts (through AR), to a virtual environment (through VR) [21].

When the application is launched, detection of the ground plan is performed using a camera. When a user tapping on the screen, the application will spawn 3D door of the virtual museum. The user can visit the museum by entering a 3D door, and the system will spawn a 3D museum area. User can move around the museum and discover a gallery of old photos of Fez, watch videos about the heritage of Fez and discover some monuments in 3D.

However, it is not always stable, especially when the developer adds the big 3D objects to the scene. This application still needs to evaluate the performance, based on survey from user. Alternative solution is to reduce dimension of the 3D object and optimized it.





Fig. 3 V-Museum scene

Methodology

The overall functionality of our research about VR Batik Exhibition is represented in term of a UML use case diagram as shown on the next figure.

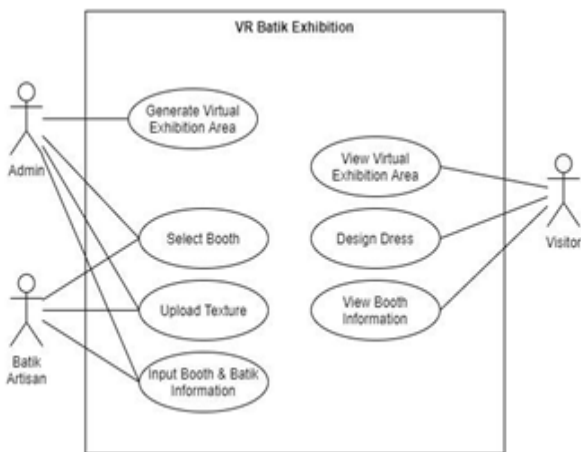


Fig. 4 Use case diagram VR Batik Exhibition

Fig. 4 illustrates that the system can be accessed by three types of users: admin, batik artisans, and visitors. Only admin can generate a virtual exhibition area. The system will generate an exhibition area include several booths complete with the property for batik display. Admin and batik artisans can choose a booth to make modifications such as uploading batik textures and input information about booth title and batik information. Visitors can enter the virtual exhibition area and interact with batik booths or objects to get information. In the batik design area, visitors can design the mannequins using the batik texture that has been uploaded to the database.

In this research, the development will go through several stages; starting from the survey project stage, concept design, digital asset creation, game development, and testing and distribution.

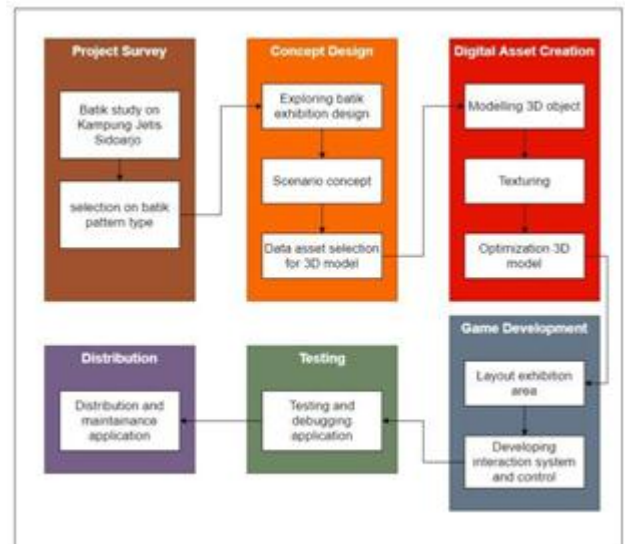


Fig. 5 VR development stage

A. Project Survey

At this stage, the main focus is to collect data about batik Jetis in Kampung Jetis Sidoarjo. Data collection includes how many artisans in Kampung Jetis Sidoarjo, the types of batik pattern, digital image texture of batik pattern, batik pattern philosophies and the design idea. After collecting all data, we will select and categorize batik pattern that will be put in the 3D virtual platform along with philosophical information for the user.



Fig. 6 Front gate Kampung Jetis Sidoarjo

B. Concept Design

At this stage, will focus on design exhibition of art and culture to get the concept of themes and references to property and furniture from the exhibition area. We will observe the art and cultural exhibition event organized by the government and organizations from last year or before the pandemic. These design and furniture are then selected to be made in 3D objects to form the exhibition area. This stage also creates concept scenario for user and concept layout for the exhibition area. Concept scenario is about where the user will start and create space for a user to

exploring exhibition area, also where to put interface to guide user exploring and gain information.

We are going to use the paper prototyping method for this purpose. Paper prototyping is effectively use for usability testing by interacting with a paper version of the interface to gain early stage feedback by users [22].

C. Assets Creation

At this stage, all data that has been collected will be selected, and objects will be created in 3D. For the object of batik cloth, it will be started by giving texture from digital photograph image texture and creating a normal map to make it look realistic in game engine later.

Property objects and furniture will be given a texture in accordance with the selected exhibition design concept. Textured 3D objects will be optimized to create the best experience and performance for the user.

D. Game Development

Game development is the core stage to combine all the concept and design into one application. Exhibition area layout is arranged based on layout design. Lighting and render set up to make the scene looks realistic and not make batik texture look flat. Music and sound effect also will be implemented in this stage to support the exhibition scene. Furthermore, with interactive interface and control, user can interact and gain information from the database about chosen batik. And then the application will be export for an alpha test. This whole process is done on the Game Engine.

E. Testing

At this stage, the system will be alpha tested by many users to gain feedback to improve the system by trying all system interactions, interfaces, control and monitoring application performance. After testing the entire system with various scenarios, the system will be built and exported into a VR system that is ready to use.

F. Distribution

At this stage, the application will be distributed to the public and community. Feedback from users will still be stored for future development.

Result And Discussion

Currently, the development is still on the survey project stage. This stage is about the study and observation of the types of batik in Kampung Jetis Sidoarjo. To provide insight into VR application that will be developed, researchers created a demo scene which will be shown to the craftsmen. To make it easier for artisans to understand the exhibition in a virtual medium.

Researchers conduct exploration and observations on exhibition designs that have been held by the government or community organizations. Some of the selected study events are batik exhibition at Museum Building by the West Java Batik Foundation; Indonesian Handicraft Exhibition by Indocraft.



Fig. 7 Batik display at the art exhibition

In this observation, we try to get the concept of booth layout and design as well as exhibition methods in displaying batik. In Fig. 4, it can be seen that batik displaying is done in three ways, displaying it on the wall, displaying it on cloth hangers and in the form of finished clothes which are attached to the mannequins. From this information, the researcher started the 3D modelling process of the property object as a batik display medium. Furthermore, the texturing and optimization process will be carried out.



Fig. 8 Model asset creation for display

The next stage is to layout 3D objects into the exhibition area. In previous observations, the exhibition layout is divided into several areas according to the type of batik pattern. After the separation area, we arrange the display properties in these areas. This layout process is conducted in the game engine, so the results can be seen directly from the model that has been textured and optimized. In this demo exhibition area also need to have a good light setup to make the scene looks realistic.



Fig. 9 Demo layout design

At batik exhibitions, usually, there is information about the batik pattern on display. Generally, at the exhibition, this information is conveyed directly from the craftsman, or this information is conveyed in the form of a paper note which will be placed on the batik. This information contains data about the type of batik pattern, the philosophy, the design idea behind it and identity about the craftsman.



Fig. 10 UI detail information about batik pattern

In the demo scene, information about batik will be shown using a graphic user interface (GUI) that will adjust the user's camera position. GUI information should be visible without blocking the batik object. This information data is stored in the application database.

In the exhibition area, some mannequins can be used by users for designing batik clothes. User interaction system and control are still in the next development stage. The challenging part is how to make user can change and attach the selected batik pattern to the mannequin dress easily using VR controller.



Fig. 11 Mannequin for interactive batik design

In the exhibition area, some mannequins can be used by users for designing batik clothes. User interaction system and control are still in the next development stage. The challenging part is how to make user can change and attach the selected batik pattern to the mannequin dress easily using VR controller.

After completing the demo application, the application will be shown to the craftsmen to get feedback to improve the system in the next stage of development. Virtual world allows the user to use very high-resolution texture.

Conclusion And Future Work

The technologies above mentioned are still at the prototype stage. This study aims to find answers to the problems currently being experienced by batik craftsmen and aims to introduce virtual media for public use. Apart from answering economic issues, virtual media can also reach a broader market without having to come to the exhibition location.

The authors believe that with future developments in the virtual reality exhibition is capable of solving a much broader complex problem. VR has given life to a new kind of exhibition, providing access to people who are limited or disabled and can't visit the display in person.

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