



Exploration of Virtual Reality Technology Implementation in the Mobile Application of Balaputra Dewa Museum

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Abstract. A museum is a repository that showcases valuable collections encompassing historical artifacts, art, and scientific exhibits, intended to capture the attention of the general public. However, to gain a deeper understanding of the historical collections within a museum, often a more profound exploration is required. One of the main challenges is the limited availability of information, which hinders visitors from obtaining adequate knowledge about these collections. Traditionally, museums have provided information in the form of brochures, which are not always effective. Interactivity plays a key role in modern application development. While virtual tour technology has been widely used to introduce buildings, its use as an educational tool is still evolving. This research adopts a methodology involving literature review, needs analysis, data collection, application design, development, implementation, testing, and conclusion drawing. The result is an Android-based application that incorporates virtual reality technology to offer a virtual tour experience at the Balaputra Dewa Museum. This application is expected to enhance accessibility and visitors' understanding of the historical collections in the museum.

Keywords: Virtual Reality, Virtual Tour, Museum, Application, Android.

1 Introduction

The advancement of technology is rapidly progressing in various aspects of life. One form of current technological development is the utilization of Virtual Reality (VR). Virtual Reality (VR) is a technology that enables users to interact with a virtual environment simulated by a computer, allowing users to feel like they are present within that environment. VR environments can be displayed on a computer screen or through stereoscopic displays and are typically accompanied by various types of information such as text, video, and audio [1]. VR technology can be utilized for various purposes, one of which is Virtual Tour. A virtual tour is a simulation of a real-world environment presented online, consisting of collections of panoramic photos, images, videos, and virtual models of actual locations [2]. The term "virtual tour" is often used to describe various types of video and photography-based media. The word "panorama" indicates

an uninterrupted view. Panoramas can be a collection of elongated photos or video captures with a camera that can rotate or shift.

Virtual tours make significant contributions to various fields, including advertising and marketing, architecture and construction, entertainment, education, and as virtual location documentation. One implementation of virtual tour applications in the field of education is the utilization of online virtual tours for introducing historical collections found at the Balaputra Dewa Museum in South Sumatra [3].

A museum is defined as a building used as a place to exhibit items of public interest, such as historical artifacts, art, and science. When museums are explored more deeply, information about the collections displayed in the museum can be conveyed comprehensively. However, museum visitors have traditionally obtained information through written descriptions or explanations found around the objects, such as information boards, museum guides, books, and brochures.

The common issues faced at the Balaputra Dewa Museum include the fact that not every visitor can be accompanied by a museum guide to provide detailed information about the museum's collections. Additionally, many visitors tend to be passive, merely glancing at the exhibits without actively seeking information from museum guides about the historical objects on display. Furthermore, the Balaputra Dewa Museum lacks interactive online promotional media as a means to introduce Indonesian history on a national and international scale. A mobile-based virtual tour application is needed to provide convenience for the public in accessing information related to Indonesia's historical heritage and to offer a new tourism experience for the community. The virtual tour application utilizes 360° photos to showcase the environment at the Balaputra Dewa Museum, allowing users to access historical information through text and audio.

Furthermore, the developed application can enhance visitors' interest in exploring museum collections via smartphones. Moreover, the museum adopts a unique approach to delivering education to visitors, aiming to boost the enthusiasm of the younger generation in learning more about the museum and its exhibited collections.

2 Literature Review

Machine learning techniques have been effectively used for the diagnostic modeling of dengue. Several studies have demonstrated the potential of machine learning algorithms in accurately diagnosing dengue and differentiating it from other febrile illnesses.

2.1 Museum

The word "Museum" originates from ancient Greek, "Mouseion," which means a temple or place of worship dedicated to the worship of the Muses, goddesses of the arts. These temples or places of worship for the Muses were called "Muzeum." Thus, the word "museum" originally derives from the word "Muze," which later evolved into "Mouseion" in Greek, and then transferred into Latin and English as the word "Museum" [4].

2.2 Virtual Reality

Virtual Reality is defined as a highly interactive computer-based multimedia environment in which users become participants in a computer-generated world [5]. VR is a simulation of a real or imaginary environment that can be visually experienced in three dimensions based on width, height, and depth. It can also provide interactive visual experiences in real-time with sound and possibly with touch and other forms of feedback. There are four main elements in VR technology as follows [6].

1. A virtual world is a 3D environment that is primarily manifested through rendering, displays, or similar media.
2. Immersion means providing the user with a perception of presence in a non-physical or virtual world.
3. Sensory feedback, It means that VR can influence multiple senses, including visual, tactile, auditory, and others.
4. Interactivity It means providing users with a natural and comfortable experience as they engage with the virtual world

2.3 Virtual Tour

A virtual tour is a simulation of a real environment, typically consisting of a collection of panoramic photos, interconnected images through hyperlinks, videos, or virtual models of actual locations. It may also incorporate other multimedia elements such as sound effects, music, narration, and text [7]. Virtual tours utilize videos or photos with a 360-degree perspective to allow users to view the entire surroundings from the actual location.

There are three types of views in 360-degree photos: cylindrical, spherical, and cubical (Figure 1). In the (a) cylindrical view, a 360-degree horizontal panorama is shown in a circular form resembling a cylinder, without showing the top and bottom. In the (b) spherical view, a 360-degree panorama is displayed in a spherical shape, covering both horizontal and vertical perspectives, allowing every angle to be seen in the capture. In the (c) cubical view, a panorama resembling a cube with six sides is presented, and the meeting points of its sides can be seen when viewed in 360 degrees.

The presentation of a virtual tour can be done by utilizing images or videos, and it can also involve the use of three-dimensional models. In the case of presentation using images, panoramic photos can be employed. The choice of panoramic photo types also influences the resulting virtual tour [8].

3 Methodology

This research employs the Multimedia Development Life Cycle approach, and the research phases conducted are as follows.

1. Concept

The virtual tour application created is an Android-based mobile application that uses 360-degree photos as the environment within the application, focusing on the research object, which is the ceramic room at the Balaputera Dewa Museum in South Sumatra. In addition to the 360-degree photos, several multimedia contents displayed in this application include museum collection information in the form of 2D images and text, directional indicators, a minimap, background music, loading animations, and descriptive text. The target users are individuals who possess smartphones running on the Android operating system, with a minimum specification of having a gyroscope sensor.

2. Application Overview

(1) Application Overview

The application to be developed is a virtual tour of the traditional craftsmanship and artifacts in the Balaputera Dewa Museum. The application is an Android-based mobile app that will use a set of 360° photos as its environment. It includes directional indicators to move the user's position in that direction. There is also a minimap that shows the user's current position. Hotspots are placed on museum collections, and when clicked by the user, they will display multimedia content such as images and text about the collection.

(2) Interface Design

Interface The interface design displays a simplified interface layout that shows the arrangement of icons, functions, content, and so on, which will serve as a reference for creating the interface to be used in the virtual tour application.

3. Material Collecting

1) 360° Photo

The 360° photo in the ceramic room of the Balaputera Dewa Museum will be used as the virtual tour environment. Each displayed photo will represent a scene that will be traversed during the virtual tour. These photos are of spherical type, allowing users to view every corner of the scene to be loaded. Before being used for application development, these photos are edited to remove any distracting objects in them.

2) Museum Collection

The content of the museum collection information to be displayed includes 2D images along with textual descriptions of the collection. Users can access the museum collection information by clicking on the marked hotspots on the respective collection items. The museum collection to be used is derived from the ceramic room and obtained from the "Google Arts & Culture" website for the Balaputera Dewa Museum.

3) The minimap and background music.

The minimap used in the application provides a simple layout of the ceramic room. This minimap can display the user's location while taking the tour in the application

4 Discussion

The results of this research are presented in the form of an Android application that can be run on Android smartphones. This application assists visitors in viewing the room locations and obtaining information about historical artifacts. With the virtual tour, users can directly observe the museum's surroundings and historical artifacts without having to visit the location in person

4.1 Interface Appearance

Figure 1 represents the homepage view of the Balaputra Dewa Museum virtual tour application. Users can explore rooms and historical artifact by selecting the map on the left side of the interface or by pressing buttons at the bottom of the application



Fig. 1. Landing Page Virtual Tour Museum

Users can easily navigate exhibition rooms inside the museum by selecting the available floor plan images.

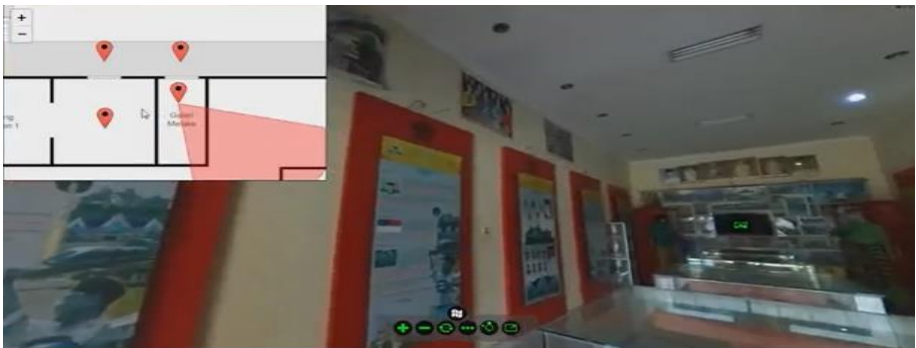


Fig. 2. Virtual Tour Museum Floor Plan Page

Figure 3. Displays the page of historical artifacts located within the exhibition room. Users can select the historical artifacts they are interested in, and the system will display information accordingly.



Fig. 3. Virtual Tour Historical Artifact Page

The selected historical artifact will display information as shown in Figure 4 below.



Fig. 4. Historical Artifact Information Page

5 Conclusion

Based on the discussions from the previous chapters, addressing the research questions, research objectives, and referring to the system's process and outcomes, the following conclusions can be drawn:

1. The Balaputra Dewa Museum virtual tour application can enhance global accessibility to the museum's location. Users can explore the museum without the need for physical travel to the museum.
2. A museum virtual tour can serve as an effective tool for education and knowledge.
3. A virtual tour application can reach a wider audience

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