MUSEUM TOUR GUIDE

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ABSTRACT

With the introduction of the latest features, mobile devices have become more widespread and convenient. In addition to the basic functionality so far, mobile apps have been used in a variety of ways to support consumers. For example, when identifying spots in daily activities. With advances in smartphone and cellular technology augmented reality-based applications are becoming more important in everyday life. Augmented reality (AR) is a technology that integrates the virtual environment of a smartphone with the real environment of the neighborhood from the user's point of view. Augmented reality graphics are computer-generated images that overlay the physical world. AR and Position Dependent Services are becoming more important for these features and are now included in various solutions for mobile devices. The augmented reality smartphone app is a handy tool for improving user experiences. Using the combination of the AR and a physical location, the application can view the details of the location which the user would like to view and experience. This project describes the development of a museum tour guide application that utilizes augmented reality technology to enhance the visitor experience. The project involved the design and implementation of a normalized database to store information about the artifacts in the museum, as well as the development of a user-friendly mobile application for visitors. The application allows visitors to view information about the artifacts, as well as 3D images and AR renderings.

Keywords: Augmented Reality, Interactive Museum Tour

I. INTRODUCTIONS

The current Internet offers tourists a variety of choices for finding fascinating information and arranging their activities. Recent advancements in information and communication technology enables tourists to obtain useful information while on vacation via the Internet. Smartphones are widely used in this field, with millions of iOS and Android smartphones in use worldwide. Tourism has emerged as one of the well-suited industries to mobile technology and mobile apps, as has been the case with other information and communication technologies.

The goal of the project's design and development is to create a museum tour guide application that will help museum visitors. This museum tour guide project is a mobile app that employs augmented reality to make the user's perspective more interactive. When employing augmented reality technology, the app uses the camera to stream through artifacts, detect them, and render a 3D model and title of the artifact. After detection the application prompt the user to navigate to the details page and the user can read and learn more about the artifact. The use of augmented reality technology in museums will contribute significantly to the transition of museums and may lead to future interactive applications.

II. PROBLEM STATEMENT

Imagine being in a museum with all the historic artifacts and not being allowed to touch them thus not living or feeling the real experience of how your ancestors lived thousands of years ago. Augmented Reality, AR in short, is an interactive experience of the real-world environment where real life objects are enhanced by a computer-generated perceptual information. This is what our museums are lacking and it's really having a great impact on the number of visitors to Zimbabwean tourism industry as it directly falls under it.

According to Zimbabwe Tourism Authority (ZTA) statistics, the number of visitors from both outside the country and locally have been falling and minimum activity is experienced in the tourism industry. The Zimbabwe

Economic Policy Analysis and Research Unit (ZEPARU) has completed a research study entitled "Positioning the Zimbabwe Tourism Sector for Growth: Problems and Challenges". The main purpose of this study was to identify factors that could drive tourism growth and to provide policy recommendations on how to put the industry in a long-term growth path that supports the country's economic goals. This study acknowledges that this sector faces many challenges that impede growth. This includes poor marketing, lack of institutional coordination, skill and experience limitations, and lack of domestic tourism promotion, unfriendly visa policies, and restrictions on the use of ICT.

Traditionally museums make use of people who tour guide the visitors through the historic artifacts and explaining in details. However, this method is efficient but it have a down side which can do more damage to the museum. For example, if the staff tours come to work not in a good mood because of personal staff they might not handle clients professionally and hence driving away visitors and crippling the tourism industry and the economy at large. The goal of this research is to develop a mobile augmented reality museum application that can tackle the challenges mentioned earlier. The mobile application should give users the experience by adding the augmented reality technology, which adds 3D view of images and animations to artifacts.

III. RELATED WORKS

Augmented Reality as an Interactive Museum Guide in Zimbabwe

Augmented reality technology has been widely used in various applications, including museums, tourism, and education. In Zimbabwe, a project was conducted to create an interactive museum guide using augmented reality technology for the National Museum of Zimbabwe (1). The project utilized AR to create 3D models of the museum's artifacts, which visitors could interact with through a mobile application. However, the project did not incorporate real-time object recognition and object-specific information.

Ghana Heritage AR Tour

In Ghana, an augmented reality application was developed for tourism, allowing users to explore historical sites and landmarks using AR technology (2). The application showcased Ghana's cultural and historical artifacts. The museum tour guide application can build upon this project by incorporating AR technology to create an interactive museum tour that showcases Zimbabwe's cultural and historical artifacts. Visitors can use their mobile devices to scan objects and view 3D models of the artifacts, providing them with a more interactive and engaging experience. The application can also incorporate information on the history and significance of the artifacts.

Augmented Reality for Science Education (AR4SE)

In South Africa, an augmented reality-based application was developed to enhance teaching and learning (3). The application allowed students to interact with 3D models of scientific concepts and historical artifacts. This project can be adapted to create an AR-powered museum tour that provides visitors with an interactive and engaging experience. The museum tour can include 3D models of artifacts and interactive exhibits that teach visitors about African history, art, and culture. The AR technology can also incorporate quizzes and interactive activities that test visitors' knowledge of the artifacts and encourage further exploration of the museum.

Augmented Reality for Museums and Exhibitions (ARME)

In Uganda, a project explored the use of augmented reality technology in exhibitions (4). The study examined the benefits of using AR technology in enhancing visitors' engagement and learning experience in the museum. The museum tour guide application can complement the use of AR technology in exhibitions by creating an AR-powered museum tour that showcases Ugandan artifacts and specimens. Visitors can use their mobile devices to scan objects and view 3D models of the artifacts, providing them with a more interactive and engaging experience. The application can also incorporate information on the history and significance of the artifacts.

IV. SOLUTIONS

The goal of the project's design and development is to create Museum Tour Guide application that will make visitors navigate the artifacts easier. To solve the issues described in the problem description, a system with the following objectives was created:

To develop a mobile application that
- Allows users to search for items they want to explore in the museum.
- Detect images and give full information to user.
- Allows visitors to find relevant adequate information about artifacts listed in the museum.

A. Solution architecture

The user must first download and install the program, as well as grant the necessary rights. The user logs into the app, and if they are a first-time user, they must register to

create an account. The database contains information about artifacts in the museum and their respective 3D images. After that, if the Stream Screen is selected in the app, the camera opens and starts scanning for images and if any are detected the 3D is rendered and other animations.
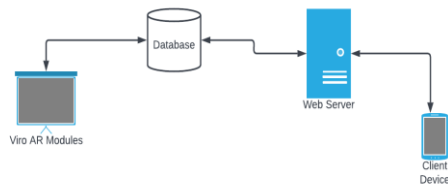

Figure 1: Architecture Solution

B. Coding Strategy

The coding strategy is a set of actions used to complete all of the project's goals. Because of the project's large size, it was separated into many parts. Before the database was constructed, a detailed design of how it would be structured was drawn. Before the classes were established, the structure and connections between them were determined. Some of the features were created by trial and error until the intended outcomes were achieved.

B. Experimentation and Testing

Function	Expected Result	Status
Login	Authorize use	Success
View Artifacts	View artifacts listed in the museum	Success
View Artifacts Details	View details about artifacts in the museum	Success
Stream Artifacts using AR	Stream artifacts in the museum, detect them and render the 3D and title of the artifact.	Success
View details after detection	Navigate to the details page of the detected artifact.	Success
Logout	Should logout the user from the application	Success

Table 1: Experimentation and Testing

V. CONCLUSION

In conclusion the mobile application has managed to bridge the gap between visitors and artifacts in the museum by providing adequate information to visitors. It also managed to use augmented reality effectively by helping visitors to have navigation through the museum artifacts and give them a better experience as they view artifacts in 3D using augmented reality.

VI. FUTURE WORKS

There is always room for improvement on the mobile application. Virtual Reality can be used to increase user experiences. Payments can also be implemented to help tourist make payments on a single application, portals can also be implemented to also add the ability to have an augmented view of how people used to live. Another functionality that can be implemented is to integrate virtual reality to enable users to wear googles and have an enhanced tour instead of using mobile phones camera. Google maps API can also be implemented.

VII. ACKNOWLEDGEMENTS

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