Development Mobile Application of Bandung Tempo Doeloe based on Augmented Reality Using GPS Tracking Method

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Abstract—Bandung city is a tourism city in Indonesia, in addition there are historic buildings of the city of Bandung. The importance of knowing history so that history is not forgotten and lost. Augmented technology is technology that can create an interest in knowing something. Therefore, the authors make a mobile application in Bandung based on augmented reality with GPS tracking method, making it easier for those who want to know historical places and explain more interesting and deeper history in the city of Bandung.

Index Terms—City of Bandung, Augmented Reality, GPS Tracking.

I. INTRODUCTION

Progress in the field of information and multimedia technology is growing rapidly, especially in the field of Mobile Technology. One of them is Augmented Reality technology, Augmented Reality is a technology that combines two or three dimensional virtual objects into a real three-dimensional environment [1].

In the city of Bandung there are historical buildings such as Gedung Sate, Gedung Merdeka, Perjuangan Monument and Masjid Raya. For people who want to know the history of the place, it has been provided by the Bandung city government namely bandros or Bandung tour on bus. But to use the bandros must be queued, because many are also interested after the list is required to wait for bandros to arrive. In bandros there is a tour guide that tells the history of the places bandros passed. But the tour guide only tells a little bit of its foundation, not too complete.

Therefore an application is needed to explain the history in depth, also interesting and interactive. In addition it has a free time efficiency so that users do not have to use bandros to want to know the history of the city of Bandung and combined with technology that is very interesting and makes it easy for users to learn something that is Augmented Reality [1]. Application that can notify users of the location of the place and after the location there will be Augmented Reality technology to explain its history. But at this time, applications to support this are still rarely found. Many studies to display the history of buildings or historic sites [2,3] or historical objects [4] still use markers.

A. Problem Formulation

Based on the problem that has been explained in the background section of the problem, then the problem can be formulated as follows:

1. How to create a Bandung Tempo Doeloe mobile application using Augmented Reality technology with the GPS Tracking method?
2. How do you visualize history to the Bandung Tempo Doeloe mobile application using Augmented Reality technology with the GPS Tracking method?

B. Purpose

Research on the problems that have been explained in the background section of the problem, aims as follows:

1. Create a Bandung Tempo Doeloe mobile application using Augmented Reality technology with the GPS Tracking method.
2. Visualize history to the Bandung Tempo Doeloe mobile application using Augmented Reality technology with the GPS Tracking method.

C. Limitation Problems

This research is only to visualize the tourist attraction building in the city of Bandung into the 3D model and its brief explanation and is limited by the following:

1. This application only displays video, images, text and sound explanations of its history.

2. There are only 4 historical buildings in this application.
3. Explanation of its history only briefly explained is not too significant.
4. Will only work if it is within the specified radius.

D. Development Methodology

In conducting practical work activities, the authors use the Multimedia Development Life Circle method. The stages in the systematic MDLC are as follows:

1. Concept

The purpose of making an application is to make an augmented reality application [5,6] if the user is in a place that has been determined then this application can be run to display at a glance the video, image, text and historical sound explanation of the place.

2. Design

For this stage the authors do by making a mock-up view of this application for designing the interface display and making system modeling with UML models.

3. Material Collection

The collection of material for the writer to look for some on the internet, and visit a place that has been determined to request historical material from the place directly.

4. Assembly

The making stage of this application uses Unity 3D.

5. Testing

For testing the author will document in the form of a video, due to locations that are not possible to be tested on the same day. Add 1 location at the test site, Widyatama University Main Hall, for direct testing. Testing can also be in the form of a black box to check each function made.

6. Distribution

This stage is the last stage in the multimedia development cycle. Distribution can be done after the application is declared to be suitable for use. At this stage, the application will be stored in a storage medium such as a CD, mobile device or website. If there is not enough storage media to accommodate the application, compression will be performed on the application. The evaluation phase is included in this stage. An evaluation is needed for the development of products that have been made previously in order to be better.

II. Literature Review

A. Augmented Reality

Augmented Reality or in the Indonesian language Augmented Reality and known by the English abbreviation Augmented Reality (AR), is the merging of virtual objects with real objects [1,2].

Along with its development, augmented reality has several techniques in the tracking process, including the following:

1. Marker Based Tracking

This technique uses a square black and white marker with a thick black border and a white background.

2. Markerless Tracking

various MarkerlessTracking techniques as their flagship technology, such as Face Tracking, 3D Object Tracking, and Motion Tracking, GPS Tracking [7-9].

B. GPS Tracking

GPS tracking technique utilizes longitude and latitude locations as a tool to detect objects in realtime. This technique is usually used on smartphone devices that have GPS features.

C. Android

Android is an operating system for Linux-based mobile phones that includes an operating system, middleware and applications. Their own Androids for use by various provides an open platform for developers to create mobile devices [10-12].

D. Unity 3D

Unity Engine is a game engine that continues to grow. This engine is a game engine with a proprietary source license, but the development license is divided into 2, which are free and paid according to the target device for application development. This unity can make it easier for users to develop applications based on augmented reality [6,7].

E. UML

Unified Modeling Language (UML) is a language that has become the standard for visualizing, establishing, constructing and documenting artifacts of a software system [13].

The use of this model aims to identify the parts included in the scope of the system discussed and how the relationship between the system with subsystems and other systems outside it.

F. City of Bandung

The history of the city of Bandung starts with the legend of Sangkuriang, which tells how the lake formed in Bandung and Tangkuban Perahu Mountain. Water from the Bandung Lake according to legend, began to dry because it flowed through a cave called Sanghyang Tikoro. Situ Aksan is the last area of the remnants of Lake Bandung that has dried up. In the 1970s it was still a lake of tourism, until now it has become a residential area for settlements.

On 1 April 1906, the City of Bandung officially received the *status of gemeente* (city) from the Governor

General J.B. van Heutsz with an area of around 900 ha. In 1949, it increased to 8,000 ha.[9,10].

G. Gedung Sate

Gedung Sate, located in Bandung, during the Dutch East Indies was called Gouvernements Bedrijven (GB). Laying the first stone the construction of the satay building was carried out by Johanna Catherina Coops, the eldest daughter of the Mayor of Bandung, B.Coops and Petronella Roelofsen, who represented the Governor General in Batavia, J.P. Graaf van Limburg Stirum, on July 27, 1920. At the very top end of the Gedung Sate there were 6 skewers showing that the cost of building a satay building cost 6 Holden.

Since 1980 the satay building is identical to the West Java Provincial Government Office which is the Office of the Governor of West Java along with several other government officials in the Gedung Sate.[14].

H. Gedung Merdeka

The history of the Museum of Asian-African Art in Bandung cannot be separated from its venue, namely Gedung Merdeka as a gathering place for Europeans, especially the Dutch who reside in Bandung and its surroundings. On June 29, 1879 the Dutch established an association with the name Societeit Concordia. Architect C.P. Wolff Schoemaker highlighted the Art Deco style of this building during its construction in 1921. The building was renamed Dai Toa Kaikan during the Japanese occupation of 1942-1945. In 1949 the building underwent repairs and was again used as the Societeit Concordia.

In 1954 the government set Bandung as the location of the KAA, so this building as the biggest and grandest meeting place in Bandung was chosen as the location of the conference. Therefore, before the Asian-African Conference in 1955 the name was changed by President Soekarno to Gedung Merdeka[15,16].

I. Masjid Raya Bandung

This large mosque was first built in 1810, and has been renovated several times. Noted, around the 19th century this mosque had undergone several renovations, then in the 20th century was carried out five times carried out renovations.

The renovation was from the change of walls and roof to the expansion of the mosque itself. Finally in the 21st century, he was renovated again in 2001, until finally on June 4, 2003, right on January 13, 2004 the construction of the new mosque was completed, and at the same time changing its name to Bandung Raya Mosque in West Java province [17-18].

J. Monumen Perjuangan Bandung

West Java Struggle Monument known as Monpera or Monju. At the bottom of this monument building is a fairly large room that serves as the Museum of History of the Struggle of the People of West Java. Inaugurated by the governor on August 23, 1995.

The form of the West Java Struggle Monument is not single, but plural. Embodied in the five elements of form which form a harmonious whole, which are almost the same to each other.

There is no struggle without unity, so it must be a bond, but to become a bond of unity requires struggle. All of that is realized in the design of a flexible, plastic building, not massive, but woven, which was designed by an architect from Bandung, Slamet Wirasonjaya and artist Sunaryo[15].

III. RESULT

A. System Analysis And Design
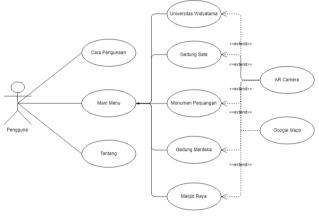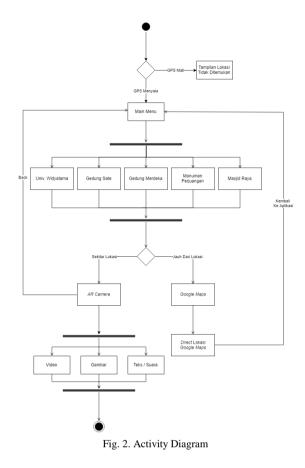
1. Use Case Diagram

Fig. 1. Use Case Diagram

Based on Fig. 1, it explains that the user can choose how to use the page, about the application and main menu. In the main menu there are 5 historic places consisting of Widyatama University, Gedung Sate, Monumen Perjuangan, Gedung Merdeka and Masjid Raya. If you choose one of these places the user can go to the Google Maps page if the user is far from that location and to the AR Camera page if the user is close to that location.

2. Activity Diagram

Based on Fig. 2 explains the flow of this application, starting from opening this application checking the location service or GPS, if non active will go to display a notification that the user's location or GPS is off. If the GPS is active it will go directly to the main menu page. In the main menu page there are historic locations namely Widyatama University, Gedung Sate, Monumen Perjuangan, Gedung Merdeka and Masjid Raya. The user selects one of these places and then checks whether the user's location is close to the selected location, if the user around the location will go to the AR Camera page that displays videos, images, text and sound from the historical explanation of the location. From AR Camera the user can return to the main menu page. If the user is far from the selected location it will go to the Google Maps browser and can do direct locations and then return to the application, the main menu user can choose the location again.

Fig. 2. Activity Diagram

3. Design User Interface

Fig. 3. UI Main Menu

Fig. 3 is the main menu display, there are historic locations. There is also a distance of the location from the user's location and there is a location icon which later if it changes color indicates the user is near that location. If the location icon is lit and the user selects that location an AR Camera page will appear, or if the location icon is not lit and the user selects that location then the Google Maps browser will appear.

Fig. 4. UI AR Camera

Fig. 4 is an AR Camera display, there are welcome sounds, video buttons, images and text. There is also a start icon in the text to start a historical explanation by voice.
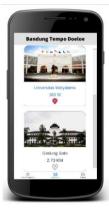
B. Implementation

1. User Interface

Fig. 5. UI Main Menu

Fig. 5 is the main menu display. There are historic locations in the city of Bandung. Equipped with the distance between the user's location and the location of the place. The location icon indicates that the user is near or far from one of the location locations in the application. Other menus are menus for how to use and menus for about.

Fig. 6. UI AR Camera

Fig. 6 is the AR Camera display if the user selects the video button. There is a video right below the button and an explanation in the form of text below. Users can start and pause the video by clicking on the start icon on the video to start the video and clicking on the video to pause the video. If you select an image, it will replace the video position to be a picture that can be shifted.

C. Testing

Table 1 shows, result of alpha testing, there are 7 scenarios of testing and all are valid.

Table 1. Result of Alpha Testing

No	Testing Scenarios	Expected results	Conclusion
1	Open the application with GPS off	Bring up the page that the location is not active	valid
2	Open the application with GPS active	Bring up the main page	valid
3	Select a location that is a short distance away	Go to the AR Camera page	valid
4	Select a remote location	Go to the Google Maps browser	valid
5	On AR Camera if the distance is close	Bring up the picture button, video and sound history explanation	valid
6	On AR Cameraj if the distance is far	Button Image, video and sound buttons that were previously lost	valid
7	In AR Camera if GPS is turned off	Bring up a page that location is not active	valid

IV. CONCLUSION

A. Conclusion

The following conclusions are drawn from making mobile applications. The application can be operated with Android operating system minimum 6.0 Marshmellow. The application can visualize history to the Bandung Tempo Doeloe mobile application using Augmented Reality technology with the GPS Tracking method. It can provide a deeper history about historic buildings in the city of Bandung, and it can show anywhere historical buildings in the city of Bandung.

B. Suggestion

In the development of the Bandung Tempo Doeloe mobile application based on Augmented Reality with the GPS Tracking method, this has not yet reached perfection. Following is the further application development of the application, It is expected to update the AR Camera display to be more interesting and interactive. It is hoped that there is an animation related to the history of historical places.

Another additional location is expected. It is expected that there is a web server to store multimedia data that is applied video text and images so that the application is lighter.

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Authors' Profiles

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