IMPLEMENTATION OF AGUMENTED REALITY FOR SEARCHING TOURIST ATTRACTION IN FOREST PARK CONSERVATION AREA TAHURA IR. H. DJUANDA

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ABSTRACT

This research was aimed to describe the use of augmented reality technology as a medium to assist visitors in knowing the location of attractions in Ir. H. Djuanda Forest Park. The creation of this augmented reality application uses a way to export data by taking data in the Forest Park Conservation Area Ir. H. Djuanda such as questionnaires to visitors, interviews with tahura managers, and literature studies that support the theory that can solve the problem. Problems that arise with the extent of the location of tourist attractions in the Ir. H. Djuanda Forest Park,one of them is the location of the tourist attraction to be visited by visitors. Many visitors have just visited the Ir. H. Djuanda Forest Park found it difficult to find attractions in the Ir. H. Djuanda. Forest Park One solution to assist visitors in finding a place in the Ir. H. Djuanda Forest Park that is by applying Augmented Reality technology by using marker methods based on location with GPS-based tracking. To gather information, visitors can find applications that are built according to the needs of users who can help visitors to find different places in the Ir. H.Djuanda Forest Park.

Keywords: Augmented Reality, GPS, markerless, Ir. H. Djuanda Forest Park, Tourist Attraction

1. INTRODUCTION

1.1 Research Background

Forest Park Ir. H. Djuanda is one of the major forests which is a nature conservation area located in the village of Ciburial, District Cimenyan Bandung, West Java. Initially in 1965 the vast forest park was only about 10 hectares, but now the vast forest park reaches 528 hectares stretching from the Dago Pakar region to the Maribaya Lembang area.

Look at the plan of the Grand Forest Park Ir. H. Djuanda who was in front of the main entrance that was made to find from the attractions in the Forest Park, Ir. H. Djuanda. In addition to the plan in front of the main door, the visitors were also given different information, in contrast to the one in front of the main door, this guide provided sufficient information for what was in the Great Forest Park Ir. H. Djuanda.

The media that is needed which has some drawbacks, such as a small information information map, information about tourism objects is still limited, information that provides less interactive results with visitors, especially for visitors who have just visited the Forest Park, Ir. H. Djuanda. Based on the results of the questionnaire to 80 respondents, there were 63% of visitors who sought and found clear information to find out the location they wanted to go to. Visitors often describe the location to be visited.

Based on the existing context, various applications are expected to help visitors to find locations in the Forest Park Raya Ir. H. Djuanda so that object location information is more interactive and provides complete information. One way to assist in the search for tourist attractions in the Grand Forest Park Ir. H. Djuanda that is by applying Augmented Reality technology by using marker methods based on location with GPS-based tracking. Augmented Reality technology that is used today, can display 2D and 3D objects into real environments that can be broadcast in real-time. So with this technology, visitors do not have to look at maps or directions. With this application, it is expected that visitors will find it easier to find out about the attractions in the Great Forest Park Ir H Djuanda.

1.2 Purpose and Objectives

The purpose of this research is to build a mobile application that makes it easy for visitors to search for tourist attractions in the Forest Park, Ir. H. Djuanda. While the objectives of this study are:
1. Make it easier for visitors to find attractions in the Forest Park Raya Ir. H. Djuanda.
2. Provide information on the distance from the location of the visitor to the location to be visited in the Forest Park Raya Ir. H. Djuanda.

2. RESEARCH CONTENT

2.1 Augmented Reality

Augmented reality is a technology that is able to combine two-dimensional or three-dimensional virtual objects into a real environment and display these objects in real time [5]. Unlike virtual reality which completely replaces reality, augmented reality is created to add information to real objects or places. Virtual objects displayed by augmented reality cannot be accepted by users with their own senses in the real world. This makes

augmented reality technology able to help users carry out activities in the real world.

2.2 Augmented Reality Hardware

There are three main components of augmented reality hardware, the first is the camera. The camera is used to take pictures or videos in the real world that will be combined with virtual objects. The second is the processor, which is a tool to process the captured images or videos by the camera with the help of augmented reality software. The third is the screen that is used to display the final result after processing by the processor [5].

2.3 Markerless Augmented Reality

In contrast to augmented reality based markers, this markerless method does not require a sign or identifier to display virtual objects. Some examples of markerless augmented reality are face tracking, 3D object tracking, motion tracking, and GPS based tracking [5].

2.4 Augmented Reality Principle

Augmented reality is a technology that is able to combine two-dimensional or three-dimensional virtual objects into a real environment and display these objects in real time. Locations can be found by GPS tracking to find a coordinate point for each location searched in an area that has been registered in the database. From the coordinates (latitude and longitude) of the location, it will be marked by a marker or marker at each coordinate point of the location to be searched which will be displayed on the mobile screen [5].

2.5 Android

Android is a linux-based operating system designed for touch screen mobile devices such as smartphones and tablet computers [6]. Android is open or open source which allows developers to create their own applications. Initially Android was developed by Android Inc., then Google bought it in 2005. This operating system was released in 2007 along with the establishment of the Open Handset Alliance. The first Android phone sold in 2008. There are two types of distributors of the Android operating system, namely the first to get full support from Google or Google Mail Services (GMS) and the second is completely free of distribution without Google support or known as Open Handset Distribution (OHD) Android was developed privately by Google until the latest changes and updates are ready to be released, and information about the source code is also being made public. This source code will only run without modification on certain devices, usually on the Nexus series. By providing an open source facility, Android developers offer the ability to build applications that are very rich and innovative. Developers are free to take advantage of hardware, access location information, run background services, set alarms, and much more. Android relies on the Linux 2.6 version for core system services such as security, memory management, process management, network stack, and driver models. The kernel also acts as an abstraction layer between the hardware and the entire software stack.

2.6 Discussion

Raya Forest Park Ir. H. Djuanda has a wide area. To search the location of attractions in the forest park ir ir. H. djuanda, visitors use a map in the form of a brochure given when visitors buy an entrance ticket. The map is small, resulting in limited information provided. For every visitor who just came to this place often felt a little difficulty in getting information and locations of attractions in the Forest Park Raya Ir. H. Djuanda.

In addition to using a map in the form of brochures to get information on the location of attractions in the ir forest park. h. djuanda there is a signpost. Not on every road to the location of a tourist attraction there is this signboard, resulting in visitors having trouble exploring all the locations of attractions in the forest park ir ir. h. djuanda. Visitors also often find it difficult to find information on the distance between the attractions in the Forest Park, Ir. H. Djuanda like how much distance from Dutch Goa to Curug Omas Maribaya.

To meet these needs, a system will be built that can bind the ease of finding tourist attractions and information that can help users find the desired location in the Forest Park, Ir. H. Djuanda
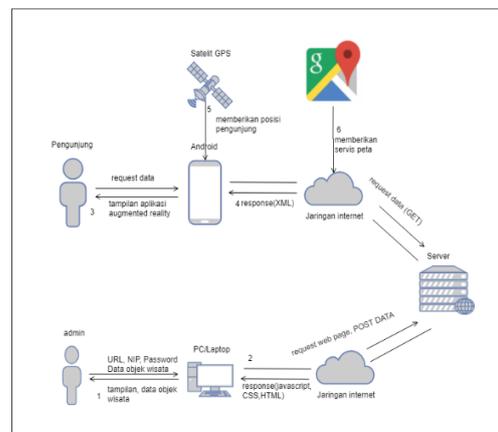
2.7 System Architecture

Figure 1. System Architecture

The following is a description of the system architecture to be built:

1. Admin opens the browser using a PC / Laptop to enter tourist attraction data.

2. By using an internet connection, the browser loads the web application from the server. Then through a web application that has been loaded by the browser, the admin enters the tourist data. The browser sends tourist data to the server using the POST method.

3. Visitors open the application using an Android device, then the Android device gives the view of the application to visitors.

4. Android devices request tourist object data from Json-shaped servers. Then the server will send tourist data to the Android device in json format.

5. Android devices ask for user coordinates, GPS satellites provide the user's coordinate position
6. Android devices request map services, Google Maps API provides map services

2.8 Location Definition with GPS

Determination of the location of objects can be done with GPS technology. Users will continue to be able to update the location as long as the user is in the line of sight. To get the coordinates of a point on the earth, the receiver requires 4 satellites that can capture the signal properly.
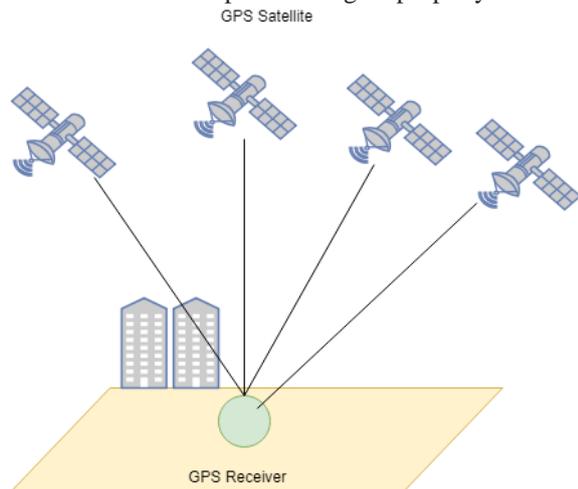

Figure 2. Line of Sight

GPS is responsible for determining the location of the user's coordinates and location. Broadly speaking, positioning with GPS is divided into two methods, namely the absolute method and the relative method.

1. The absolute method, known as point positioning, is usually used for navigation purposes. This method determines the position based on one GPS receiver only and has a level of accuracy of position in a few meters or a low level of accuracy.

2. Relative method or called differential positioning. This method has high accuracy because one GPS is installed in certain locations on earth and continuously receives signals from satellites that are sent within a certain period of time. The relative method determines the position by using more than one receiver. Usually applied for geodetic survey purposes.

The method used in this study is an absolute method that uses a navigation type single receiver, because the purpose for individual users and the devices used are devices with single receivers, namely smartphones.

2.9 Analysis of Markerless Augmented Reality Methdod

The methods carried out by augmented reality are analysis that can visualize to be augmented reality. This analysis includes GPS, Wikitude SDK, Web Service. Explanation of the three components can be seen in Figure 3.
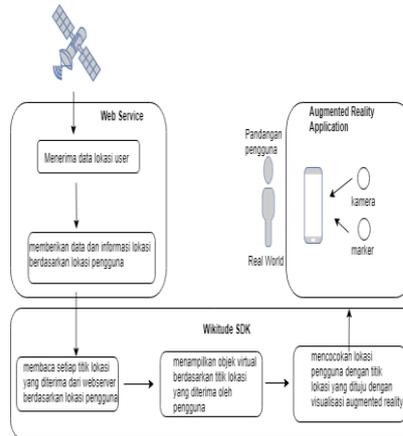

Figure 3. Markerless Augmented Reality Architecture

In figure 3 it is estimated that visitors are already in the designated area. The application can determine the user's location via GPS, after the location of the visitor is determined then the application will receive data from the web server with the condition that the smartphone used has an internet network. Data that has been translated by web service to the application will then be determined at each location point, the coordinates of the location close to the visitor. After the information data detected by the user is known, then visualize the coordinates of the location around the visitor. The form of visualization is a marker that determines the existence of the location based on coordinates (latitude and longitude) received. After the data has been visualized, the system will adjust the orientation between the real-world images captured and the virtual world that produces virtual objects in the form of augmented reality markers. Virtual objects that are tracked will be combined with sensors contained in the device, namely GPS, accelerometer sensor, compass, and camera.


Figure 4. Real world adjusment with virtual object

In Figure 4 depicted the real world becomes the initial state before the augmented reality object appears on the smartphone screen, to be able to bring up a marker that shows the location of objects through the camera, it requires GPS, JSON, and internet networks. GPS is used to determine the location of visitors, JSON data is used as a framework for providing information so that augmented reality can be displayed and the internet network is used to access data to the server in order to receive JSON data on the server.

2.10 Web Service Analysis

The following is a web service analysis on the ARTahura application can be seen in Figure 5.
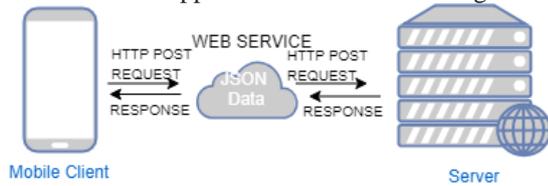
Gambar 5. Response flow and data request

Analysis in web service is used to describe in detail the data communication between client and server. Data communication between client and server can be seen in the following explanation:

1. Android Client Application Android client application is the one that requests data with web service as the communication media. The data requested by the client is in the form of a web service data exchange format namely JSON (Java Script Object Notation) so that the Android client can work by parsing the data in the JSON format.

2. Web Service Web service acts as a translator of data between the Android client and the server. The web service data exchange format used is JSON. Web service works by taking data from the server to be converted into JSON form which will then be received by the android client. The following is an example of the JSON format used in data communication:

```
{
        id:"1",
        longitude:" 107.658253",
        latitude:" -6.834777",
        description:"Goa Jepang",
        name:"Goa Jepang"
}
```

2.10 Map Analysis

Map analysis is used to find out the position of each location of a tourist attraction located in the Forest Park Raya Ir. H. Djuanda. The floor plan analysis results found in the Grand Forest Park Ir. H. Djuanda is a coordinate point of longitude and latitude which will be used as data for each tourist location.

Figure 6. Ir. H. Djuanda Forest Park Map

Based on Figure 6, there are 11 tourist sites located in the Forest Park, Ir. H. Djuanda. The location of the tourist attraction is Curug Dago & Batu Royal inscription, Monument of Ir. H. Djuanda, Information Center for Forest Park Raya Ir. H. Djuanda and Museum, Open Stage, Playground, Outbound, Goa Jepang, Goa Goa, Curug Omas Maribaya, Tebing Keraton. Here is the latitude and longitude of each of the attractions in the Forest Park, Ir. H. Djuanda. The coordinates of tourist attractions in the Forest Park Raya Ir. H. Djuanda can be seen in table 1.

Table 1. Coordinate table of object locations

No	Nama Lokasi	Latitude	Longitude
1.	Curug Dago & Batu Prasasti Kerajaan Thailand	-6.865016	107.618050
2.	Monumen Ir. H. Djuanda	-6.858069	107.629475
3.	Outbond	-6.856779	107.633715
4.	Penangkaran Rusa	-6.843444	107.647837
5.	Curug Lalay	-6.839341	107.654369
6.	Curug Kidang	-6.842159	107.651159
7.	Goa Jepang	-6.856525	107.632360
8.	Goa Belanda	-6.854452	107.637796
9.	Curug Omas Maribaya	-6.834777	107.658253
10.	Tebing Keraton	-6.833964	107.663618

2.11 Use Case Diagram

Use Case diagram is used to describe the functional needs of the system to be built. Use Case describes the interaction that occurs between one or more actors with the system to be created, a use case is represented in a simple step sequence. Use case diagrams are used to find out what functions are in a system and who has the right to use these functions. What is emphasized in this diagram is what the system does, not how the system does it.
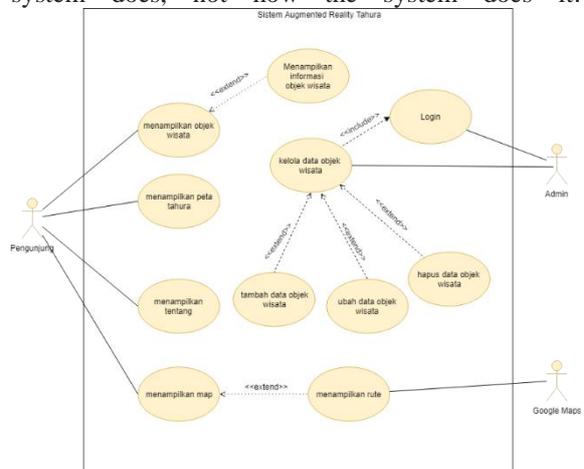

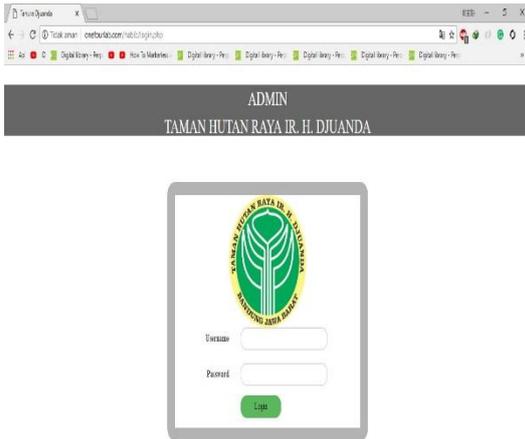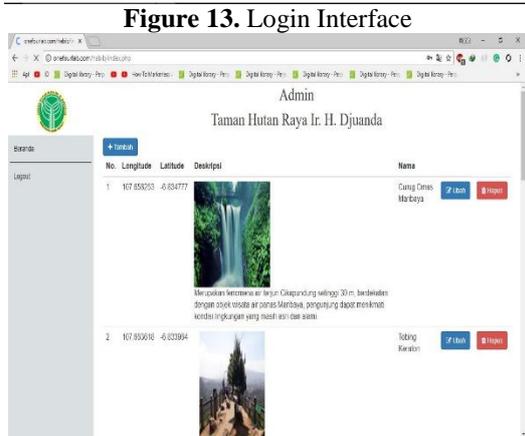**Figure 7.** Use Case Diagram

2.12 Class Diagram

Class diagrams are a specification that if instantiated will produce an object and is the core of object-oriented development and design. Class describes the state (attributes or properties) of a system, also offers services to manipulate the situation.

Figure 8. Class Diagram

2.13 Interface Implementation

Interface implementation describes the implementation of the interface design that has been done. The appearance of this interface is a display of the application that will interact directly with the user

Figure 9. Splash Screen Interface

Figure 10. Appear Tourist Attraction Interface

Figure 11. Information of Tourist Attraction Interface

Figure 12. Menu List Interface

Figure 13. Login Interface

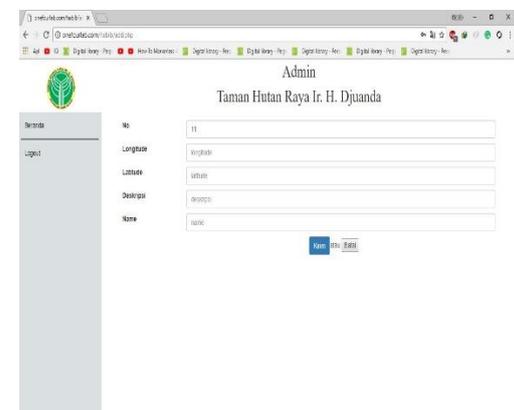**Figure 14.** manage tourist attraction Interface

Figure 15. Add Data Interface

2.14 System Testing

The system testing phase is carried out to ascertain whether all functions in the system that have been built are running well and look for errors that might occur in the system. The test carried out on the system built in this final project is testing alpha and beta functionally. The method used is the blackbox testing method that focuses on the functional requirements of the system being built.

2.15 Alpha Testing

Table 2. Augmented Reality Testing

Kasus dan hasil uji (data normal)

Data masukan	Yang diharapkan	Pengamatan	kesimpulan
Data objek wisata	Menampilkan tampilan augmented reality berupa objek virtual berbentuk marker 2d dan menampilkan visualisasi radar di pojok kiri atas layar.	Objek virtual 2d muncul pada layar aplikasi	Diterima

2.16 Beta Testing

Beta testing is done to find out how far the quality of the application has been built, whether it has met expectations or not. In this beta test, data collection is carried out on the respondent or system user using a questionnaire method. Beta testing is done on mobile and web applications. Testing on a web application is done by interviewing someone appointed as admin, while testing the mobile application using a questionnaire for 20 respondents as users of mobile applications. Based on the results of interviews with respondents, the web application (web admin) has met expectations.

Figure 16. Beta Testing

2. CLOSING

3.1. Conclusion

With the creation of a search application for the location of attractions in the Grand Forest Park Ir. H. Djuanda with the implementation of Augmented Reality as an interactive medium in the search for information built on the Android platform can be concluded that:

1. Augmented reality technology that is implemented in application can facilitate users in determining and finding the location to be addressed.

2. This application has not been able to provide distance information in real-time to the location of the object to be visited.

3.2. Suggestion

Application to search the location of attractions in the Forest Park Raya Ir. H. Djuanda is still far from perfect and there are still many shortcomings. Therefore, it needs to be developed so that this application can be better. As for suggestions that this application can be better, namely:

1. The object markers of each tourist location can be distinguished to make it look more attractive.

2. In the navigation section can be developed into augmented reality visualization in the form of arrow icon objects as a guide towards the location to be addressed.

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