THE IMPLEMENTATION OF *AUGMENTED REALITY* FOR THE RECOGNITION OF TRAFFIC SIGN SYMBOLS IN THE TRAFFIC PARK ADE IRMA SURYANI NASUTION BANDUNG

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ABSTRACT

Augmented Reality is a technology that is being talked about in the delivery of the newest information, this is because of the combination of the real world and the virtual world that is integrated and can be realized in an application that can describe and realize the creation of an application need. ARambu application is an android based application that has Augmented Reality technology which is used to help visitors visiting the Traffic Park Ade Irma Suryani Nasution in understanding the traffic signs that exist in the park. This application has several features, namely a feature to introduce the traffic signs themselves, a 3D animation simulation feature that aims to introduce signs in the form of animation, and a document photo slide feature that is used to show some locations of these signs on the highway. This application is built based on Android because most of the many visitors are using Android phones. The used method is the method of Multimedia Development Life Cycle by Luther Sutopo which has several stages, namely concept, design, collecting, assembly, testing and distribution. Based on the results of questionnaires that have been distributed to respondents in the Traffic Park Ade Irma Suryani Nasution Bandung, it is concluded that the overall system created has met the needs and in accordance with what was expected.

Keywords: *Augmented Reality*, Traffic Signs, Simulation, Documentation.

1. INTRODUCTION

Traffic signs are a set of signs that are on the road consisting of numbers, letters, symbols, sentences or combinations of them which have functions as prohibitions, warnings, orders and instructions directed at road users. In Undang-undang No. 22 of 2009 concerning Road Traffic and Transportation it is defined as the movement of a vehicle and people in the existing Road Traffic Space. Whereas Road Traffic Space itself means an infrastructure that is intended to road users, such as the transfer of vehicles, people and / or goods in the form of roads and supporting facilities [1].

Augmented Reality is a term for a new environment where the environment formed is a combination of combinations between the real world and cyberspace at the same time [2]. This technology is widely used today because it is very easy to understand. Through learning traffic sign symbols that can be used with Augmented Reality technology will be very easy for users. There are many learning methods for traffic signs such as in the traffic park Ade Irma Suryani Nasution. But the problem that arises with the vastness of Ade Irma Suryani's traffic park is that visitors do not understand about the symbols and terms that exist in this traffic park, so that the lack of material obtained from this traffic park.

Based on the questionnaire that has been shared, there were 82 respondents who answered several questions regarding information about traffic signs in the Ade Irma Suryani Nasution Traffic Park Bandung, which was conducted in the first week of November 2018. It was found that 35 respondents knew about Ade Irma Suryani Nasution Bandung's traffic park, 34 respondents did not know and understand the meaning of the traffic signs themselves, 58 respondents agreed that the importance of the description of existing traffic signs and symbols in this traffic park, 28 respondents answered that in the traffic park there was no much learning and there were 53 respondents who answered that they require an Augmented Reality application that could explain the symbols and images of traffic signs in this traffic park. Lack of knowledge and understanding of traffic signs can lead to road driving activities that are not conducive, such as parking carelessly, recklessly, stopping out of place, and so on.

ARambu application is an android based application that has Augmented Reality technology which is used to help visitors visiting the Ade Irma Suryani Nasution Traffic Park in understanding the traffic signs that exist in the park. This application has several features, namely a feature to introduce the traffic signs themselves, a 3D animation simulation feature that aims to introduce signs in the form of animation, and a document photo slide

feature that is used to show some locations of these signs on the road.

So by paying attention and considering these problems, the authors are interested in discussing in the final project research entitled "Implementation of Augmented Reality for the Introduction of Traffic Signs in Traffic Parks Ade Irma Suryani Nasution Bandung". Through this application it is expected that visitors will find it easier to understand the meaning of the traffic symbol.

The purpose of this research is to create an application that introduces visitors to Ade Irma Suryani Nasution's traffic park about the traffic signs symbols in the park.

The objectives of this study are as follows:
1. Helping visitors to understand traffic signs with the application of the introduction of traffic signs in the traffic park Ade Irma Suryani Nasution Bandung.
2. Providing more information about traffic signs to visitors to the traffic park Ade Irma Suryani Nasution Bandung.

2. RESEARCH CONTENT

2.1 Theoretical background
Below are some theories that were used as references in this study.

2.1.1 Traffic Signs
Traffic signs are a symbol or sign that is used to control traffic anywhere that is specifically designed to maintain the discipline of people on the road. The traffic signs themselves consist of restrictions, instructions, commands and warnings [9]. In Undang-Undang Number 22 of 2009 concerning Road Traffic and Transportation, it is explained that traffic signs are a set of equipment on the road in the form of letters, symbols, numbers and sentences divided into several types, namely prohibited signs, command signs, warning signs and guided signs [3].

2.1.2 Augmented Reality
Augmented Reality (AR) is a technology that combines two worlds, namely the virtual world and the real world into a new three-dimensional real environment at the same time. This *Augmented Reality* (AR) technology can display certain information from the incorporation of cyberspace and the real world with equipment such as computers, webcams, smartphones, or special glasses [2]. The method that has been developed at this time in Augmented Reality is 2, namely the method *Marker Based Tracking* dan *Markerless Augmented Reality* [10].

2.1.3 Multimedia
Multimedia is the use of media in presenting or combining several media such as images, sound, text, animation and video with tools and links so that users can interact and communicate together (Hofstetter 2001) [4]. Multimedia is interactive, which is the use of multimedia equipped with controls for interaction with users [5].

2.1.4 Android
Android is a new operating system that is currently crowded in the community that was developed by *Google* on a *mobile platform* in the form of a cellphone or netbook. Android is built using Linux Kernel which gives freedom to the developer side, so that android developers are not only for certain people [8].

Android was developed by *Google* with Open Handset Alliance (OHA). Allience Open Handset is an alliance company or association of large companies in the world on mobile devices, totaling 47 companies, either in the form of software or hardware companies and telecommunications companies aimed at developing Android itself [6].

2.2 Research Method
Below is the research method in this study, which is data collection and software development.

2.2.1 Method of Collecting Data
In this method, data is collected directly from the object of research. Stages in this method are:
 a. Study of Literature
   At this stage it will be done by studying or researching various references in the library that come from books, texts and readings, journals related to the research taken.
 b. Field Study
   At this stage it is done by visiting the place to be studied and conducting data collection directly. This consists of interviews and questionnaires.

2.2.2 Method of Software Development
The method used in the construction of software was built using the Luther-Sutopo MDLC method. This method is a method that is compatible with multimedia software development. The stages in the MDLC method (Multimedia Development Life Cycle) are Concept, Design, Collecting Content Material, Assembly, Testing and Distribution [7].
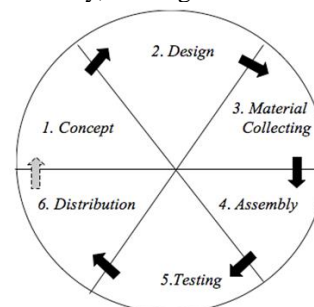
Picture 1 MDLC Method

The description of the stages is as follows:
a. Concept

This stage is the purpose and use of the application. Also specified is the type of the application itself. In this study the type of application made is the application of ARambu, namely the introduction of traffic signs in the traffic park Ade Irma Suryani Nasution Bandung with the *Augmented Reality* technology.

b. *Design*

This stage will form an overall system architecture and design of the application design that will be built.

c. *Material Collecting*

This stage will be the process of taking material from the components that will be applied in applications such as audio, video or image files.

d. *Assembly*

This stage of development of the application is carried out. In this study is using Unity3D.

e. *Testing*

This stage of testing is done after completion of the application. The test is a black box test to test its functionality.

f. *Distribution*

This stage is the deployment of applications by being saved through third parties such as Google Playstore, Google Drive, and others.

2.3 Results and Discussion

Below are the results and discussion on the construction of the ARambu application.

2.3.1 Introduction to the ARambu Application

The application was built named "ARambu" which is an Android-based Augmented Reality technology. The features in this application include the delivery of information, simulations and photo documentation of signs that have been scanned on this application.

2.3.2 Analysis of Signs

The following below is an analysis of several signs in the traffic park Ade Irma Suryani Nasution Bandung.

Table 1 Analysis of Signs

No	Name	Picture	Description
1	No Parking		To notify people who use the road that the area marked with this is prohibited from driving the vehicle.
2	Do Not Enter		To provide entry restrictions for road users.
3	No Pedestrian		To prohibit pedestrians from entering certain areas.
4	No U-Turn		To notify the user that u-turning is banned
5	Pedestria Crossing		To notify pedestrian crossings on the road
6	U-Turn		To provide location instructions from turning around the vehicle
7	Parking		To provide parking location information in certain areas
8	Rail Road		To warn to be careful when passing the railroad
9	Steep Ascent		To warn to be careful when crossing a steep ascent
10	Steep Descent		To warn to be careful when crossing a steep descent

2.3.3 System Architecture

System architecture is a structure that serves as a basis for identifying the existence of components in the system, how these components interact with each other and the organization of components in the form of a system. The following system architecture is used in the system to be built:
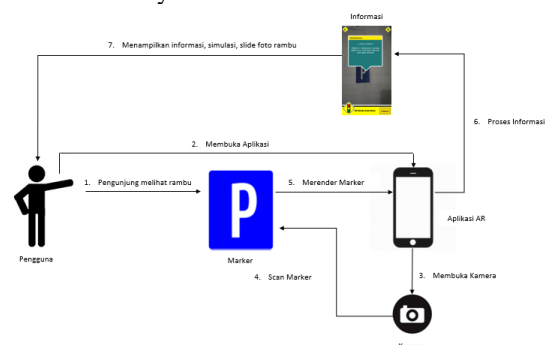

Picture 2 System Architecture

In the picture above there is an architectural description consisting of visitors, markers, and AR applications that are on the smartphone. At first the user looked at a sign and then opened the AR

application on his smartphone, in the AR application the user selects a menu to scan or scan signs which then opens the camera on the smartphone. Then from the camera the user directs the camera towards the camera, which then the application on the smartphone processes and displays information from the sign.

2.3.4 Use Case Diagram

Use Case Diagram used to describe the functional requirements of the system made. In the use case there is an interaction between the user and the system.
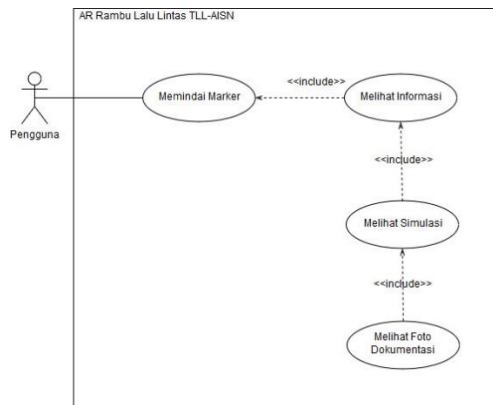
Picture 3 Use Case Diagram

2.3.5 Implementasi Antarmuka

Implementasi antarmuka yaitu pembuatan antarmuka atau tampilan dari aplikasi yang dibangun, berikut ini antarmuka dari aplikasi ARambu :

Picture 4 Homepage Display

Picture 5 Main Menu

Picture 6 Information Display

Picture 7 Simulation Display

Picture 8 Documentation Display

2.3.6 Testing of System

System testing is used to find deficiencies or errors in the application being tested. The test is intended to find out which software is made to have expectations that are suitable for users.
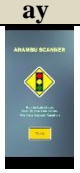
2.3.6.1 Testing of Alpha

Alpha testing is a test that is intended to determine the error of the system functionality built.

2.3.6.2 Alpha Test Results

Below is the result of the alpha testing that has been done.

Table 2 Alpha Test Results

Alpha Test Results				
Tested Compon	App Displ	Testing Scenari	Expecte d results	Test result

ents	ay	o		
Homepage		Tap the "Mulai" button	Logged in to the Main Menu page	(✓)Accepted ( )Denied
Main Menu		Tap the "Scanner Rambu" button	Logged in to the phone camera to scan markers	(✓)Accepted ( )Denied
		Tap the "Tentang" button	Logged in to the application's information page	(✓)Accepted ( )Denied
		Tap the "silang" button	Logged out of the application	(✓)Accepted ( )Denied
Traffic Signs Scanner		Pointing the camera to the traffic signs	Displaying information about the scanned signs.	(✓)Accepted ( )Denied
		Tap the "Simulasi" button	Displaying 3D animation	(✓)Accepted ( )Denied
		Tap the "back" button	Back to the main menu	(✓)Accepted ( )Denied
Simulation		Show 3D animation	Displaying 3D animation about the scanned signs	(✓)Accepted ( )Denied
		Tap the "lihat" button	Displaying documented photo slide of the scanned traffic signs.	(✓)Accepted ( )Denied
		Tap the "back" button	Back to the main menu	(✓)Accepted ( )Denied

		Tap the "silang" button	Back to camera	(✓)Accepted ( )Denied
Documented Photos		Show the documented traffic signs	Displaying the documented traffic signs photos	(✓)Accepted ( )Denied
		Tap the "silang" button	Back to simulation	(✓)Accepted ( )Denied

2.3.6.3 Beta Testing

Beta testing is a test that is intended to test directly by application users. A total of 25 people will be given several questions in the form of questionnaires related to the application.

2.3.6.4 Beta Testing Result

Below are the results of beta testing based on the questionnaire that has been done, namely as follows.
1. Do users know what *Augmented Reality* is after using the application?

Table 3 Question No.1 Calculation

Question	Answers	Score	Frequency	S
1	Strongly Agree	5	13	65
	Agree	4	9	36
	In doubt	3	3	9
	Disagree	2	-	-
	Strongly Disagree	1	-	-
Total			**25**	**110**

Percentage = (110/125)x100% = 88 %

From question number 1, it can be concluded that users really know Augmented Reality after trying the application. This is indicated by the results of the Likert scale of 88% of the response of application users.
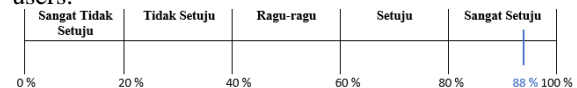
Picture 9 Interpretation of Question 1

The picture above shows the interpretation of the results of the 1st question, where the results are in the area strongly agree (in this case it is well-known), so that it can be said that the user knows very well about Augmented Reality.
2. Can the application help introduce signs quickly?

Table 4 Question no. 2 calculation

Question	Answers	Score	Frequency	S
2	Strongly Agree	5	16	80
	Agree	4	8	32
	In doubt	3	1	3

	Disagree	2	-	-
	Strongly Disagree	1	-	-
	Total		**25**	**115**

Percentage = (115/125) x100 = 92%

From question number 2, it can be concluded that the application can greatly assist application users in introducing traffic signs that are in the Ade Irma Suryani Nasution Traffic Park Bandung with a percentage of 92%.
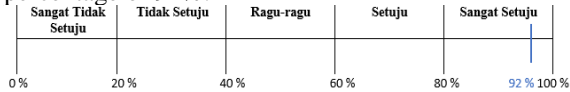
Picture 10 Interpretation of Question 2

The picture above shows the results of the interpretation of question number 2, where the results show areas strongly agree, this means that application users argue that the application made can help introduce traffic signs in the Traffic Park Ade Irma Suryani Nasution Bandung.
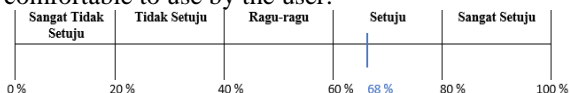
3. Is the application comfortable to use?

Table 5 Question no. 3 calculation

Question	Answers	Score	Frequency	S
3	Strongly Agree	5	7	35
	Agree	4	14	56
	In doubt	3	4	12
	Disagree	2	-	-
	Strongly Disagree	1	-	-
	Total		**25**	**103**

Percentage = (103/125)x100 = 68 %

From question number 3, it can be concluded that the application made by 68% agreed to be comfortable to use by the user.

Picture 11 Interpretation of Question 3

The picture above shows the interpretation number 3, where the results are in the agreed area. This shows that the application that has been built makes the respondent comfortable to use.
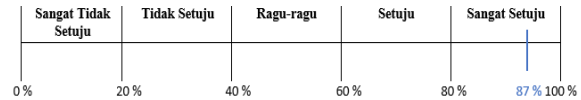
4. Is the application that has been made easy to use?

Table 6 Question no. 4 calculation

Question	Answers	Score	Frequency	S
4	Strongly Agree	5	11	55
	Agree	4	12	48
	In doubt	3	2	6
	Disagree	2	-	-
	Strongly Disagree	1	-	-
	Total		**25**	**109**

Percentage = (109/125)x100 = 87 %

From question number 4, get results with a percentage of 87% that the application is easy to use by the user.

Picture 12 Interpretation of Question 4

In the picture above shows that question number 4 is in the area strongly agree. This shows that applications that have been tried by users are very easy to use.
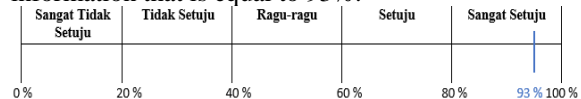
5. Do you get new experiences in getting information?

Table 7 Question no. 5 calculation

Question	Answers	Score	Frequency	S
5	Strongly Agree	5	16	80
	Agree	4	9	36
	In doubt	3	-	-
	Disagree	2	-	-
	Strongly Disagree	1	-	-
	Total		**25**	**116**

Percentage = (116/125)x100 = 93 %

From the results of question number 5 it is known that users can get new experiences in getting information that is equal to 93%.

Picture 13 Interpretation of Question 5

In the picture above shows that question 5 is in the area strongly agreed. With this shows that users get new experiences in obtaining information.

2.3.7 Software Reliability Testing

Software reliability testing is used to test applications that have been made in the field.

2.3.7.1 Testing Distance of Users with Signage Markers

Testing the distance of users with signposts is a part of collecting data to find out or measure how far the best conditions are between users and signs. Based on the measurements that has been made known as follows.

1. Distance of 0.5 meters

At this distance the quality of signs is very good to scan, but because the distance is too close so that the application signs will be completely covered by the information displayed by the application being built.

2. Distance of 1 meter

At this distance the signs are very suitable for scanning, but at this distance it is still too close, so the scanned signs are still fully closed.

3. Distance of 1.5 meters

At this distance the best conditions are recommended to scan signposts, because at this distance the signs are visible as well as the information.

4. Distance of more than 2 meters

At this distance it is not recommended, because the scanned marker has less quality, so the information displayed is not perfect, which sometimes appears sometimes not.
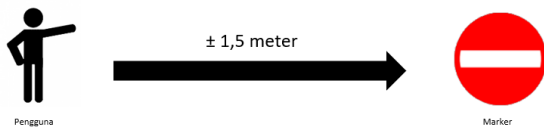
Picture 14 Testing the distance of users with the traffic sign

5. CLOSING
3.1 Conclusions
Based on the testing that has been done, the conclusions are obtained as follows:
1. The construction of this ARambu application helps visitors who visit the Ade Irma Suryani Nasution Traffic Park in obtaining information from the signs in the park.
2. This ARambu application provides more detailed information from the existing signs by making simulations and examples of photos of signs on the highway.

3.2 Suggestions
Based on all the results that have been achieved at this time, the ARambu application has several suggestions that can improve the use of this application in the future, which are:
1. Types of signs should be added, because only the traffic signs in the Ade Irma Suryani Nasution Traffic Park Bandung that are included in the application.
2. Game features or quizzes can be added so that the application will be more interesting.

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