Implementation of Geotagging Technology On Traffic Accident Relief Application

Zamzam Nurzaman [1]

Program Studi Teknik Informatika, Universitas Komputer Indonesia [1],
Jl. Dipatiukur 112 Bandung [1]
zamzam_nurzaman@outlook.com [1]

Be accepted 23 Agustus 2017
Approved 24 Agustus 2017

***Abstract*-- Based on interviews with mobility health service Officer, the Health Service assessed that the mobility service 119 is not good because there are still many people who report the accident location and the lack of clarification from the public about the victim's situation because the service is just a phone that can not give an overview Both where and how the condition of the accident so difficult to take action. In addition, the difficulty of determining which puskesmas or hospital is ready and closest to the accident victims because there is no system that can recommend and no collaboration from the puskesmas or hospital about the availability of health workers, ambulance cars and hearse so it takes time to find. Based on the problems presented, then the need to build an application for the help of traffic accidents. Based on the test results can be concluded that the application dibangn can help mobility service officers mobility in determining the action of accident assistance**

***Keywords*-- Geotagging, GPS, traffic accident help, Android**

I. INTRODUCTION

Accidents are unplanned and undesirable events. Data show that in 2015 the total number of traffic accidents accounted for 682 events resulting in 100 deaths and 811 injuries based on news reported by the PPID website. Relief to the accident victim is so important to alleviate the suffering of the victim, prevent injury or more severe illness and save lives of the victim. Relief is usually provided by people around the victim who will contact the nearest health worker. This relief should be given quickly and precisely because wrong handling can be bad, disability and even death.

Health Office is a government agency that plays an important role in health development with priority health services. Relief assistance is very important and serious to be handled, then the Health Department establishes a mobility health service that is expected to provide assistance to the victims of accidents.

Call Center 119 mobility is one of the services of mobility health services that people can use to report accidents, the public calls the number 119 and the mobility health service Officer will request the nearest puskesmas or hospital to assist victims of accidents in accordance with the address or location provided by the complainant .

Based on the results of interviews that have been done with Mrs. Amel as the health service mobility Officer of the Health Service assess the service is not good because there are still many people misreporting the accident location and lack of clear explanation from the public about the victim situation because this service is just a phone that can not give A good overview of where and how the condition of the accident so that health care personnel mobility service Dinas have difficulty in taking action.

In addition, the mobility health service officer of the Health Office has difficulties in determining which puskesmas or hospital is ready and closest to the accident victims because there is no system that can recommend and no collaboration from the puskesmas or hospital about the availability of health workers, ambulance cars and hearse So it takes time to search.

Based on the problems presented, it can be concluded the need to build a photo tagging application for the help of traffic accidents using geotagging technology on the android platform. Geotagging technology is a combination of camera features that can synergize directly with the GPS feature to provide information in realtime where and how the condition of an object [1] [2] [3] [4]. Geotagging technology is necessary because it can describe the condition of the accident and where the accident location automatically. Based on data from The Statistics Portal website shows that in July 2016 android is the most widely used operating system in Indonesia with a percentage of 73.8%.

With the construction of this application is expected to be the right solution to reduce the mistake of providing the location of casualties, provide more description of the situation of the victim and help the officer determine which puskesmas or hospital is ready and closest to the victims of accidents.

The purpose of this research is to build a photo tagging application for traffic accident assistance using geotagging technology on the android platform.

While the goal to be achieved from this research is Reduce the occurrence of error reporting the location of accidents and more illustrated the circumstances of the victims of the community so that facilitate Mobility Health Service Officer Health Department take action and Facilitate Health Department mobility health Officer in determining which health center or hospital is ready and Closest to the accident victim.

II. LITERATURE REVIEW

A. Geotagging

Geotagging is the process of adding GPS position data information (Latitude, Longitude, Altitude) in a digital photo. Camera phones that have internal GPS receivers generally have this feature. PhotoTagging GPS mechanism is when a photo is taken using a camera (digital or mobile) that has a geotagging feature, the camera or mobile phone records more information / data than a photo taken with a regular camera. Such information includes time and data when a photo is taken, orientation of the camera (portrait or landscape), whether using flash lights and other camera details used such as Aperture, Exposure, and Local Length. All of this data is stored in a place called EXIF Headers.

EXIF (Exchangeable Image File Format) headers contain photo instructions with data that can be read by a photo management app or a specific photo site. In addition, EXIF Headers also provides a space to fill in the coordinates of Longitude, Latitude, and Altitude [5].

B. Exif Header

EXIF (Exchangeable Image File Format) data is data stored by a digital camera on an image that contains information about the condition and setting of the digital camera at the time of shooting. EXIF was developed by the Japanese Electronics Industry Development Association (JEIDA) in an effort to simplify and create data exchange standards between digital image processing software and hardware such as cameras, and supported by almost all digital cameras.

General information that can be obtained from the EXIF of a digital photo is among others [4]:

1. *What date and time a photo was made.*
2. *Brand, type of camera, and type of lens used to shoot photos.*
3. *Resolution of the camera used for taking pictures. Whether or not the camera flash feature is used.*
4. *The location of the photo is taken, if the camera used supports GPS*

C. Exif Interface Android Class

The ExifInterface class is one of the classes in android programming that can be used to read and write Exif tag information in JPEG format files.

Here is a Table 1 EXIF Tag of Exif information that can be retrieved

Table 1. Tag Exif Android

No	Tagging	Keterangan
1	TAG_APERTURE	Type is String.
2	TAG_DATETIME	Type is String.
3	TAG_DATETIME_ DIGITIZED	Type is String.
4	TAG_EXPOSURE_TIME	Type is String.
5	TAG_FLASH	Type is int.
6	TAG_FOCAL_LENGTH	Type is ration
9	TAG_GPS_DATESTAMP	Type is String.
10	TAG_GPS_LATITUDE	String
11	TAG_GPS_LATITUDE_REF	Type is String.
12	TAG_GPS_LONGITUDE	String
13	TAG_GPS_LONGITUDE_ REF	Type is String.
14	TAG_GPS_TIMESTAMP	Type is String.
15	TAG_IMAGE_LENGTH	Type is int.
16	TAG_IMAGE_WIDTH	Type is int.
17	TAG_ISO	Type is String.
18	TAG_MAKE	Type is String.
19	TAG_MODEL	Type is String.
20	TAG_ORIENTATION	Type is int.

D. Google Maps API

Google Maps is a web mapping service developed by Google. This service provides satellite imagery, road maps, 360 ° panoramas, traffic conditions, and route planning for traveling by foot, car, bike or public transport.

The Google Maps API is used in web applications to display crash locations, calculate travel distance and travel time from the puskesmas or hospital to the crash site and to provide routes or directions to the puskesmas or hospital that will assist victims of accidents.

E. Euclidean Distance

Euclidean distance is the calculation of distance from 2 points in Euclidean space. Euclidean space was introduced by a mathematician from Greece around the year 300. to study the relationship between angle and distance. Euclidean is usually applied to 2 dimensions. Then it can also be simple if applied to other higher dimensions [5].

Implementation of 2 dimension Unlike the implementation of euclidean distance 1 dimension, traffic accident aid application applying euclidean distance with 2-dimensional model because according to the search form using 2 coordinate points on the surface area of the earth, which compares between the coordinate points of various objects such as: coordinates puskesmas, Coordinate the existing

hospital at the coordinate point of the user or user of the accident assistance application shown by Equation 2 Ed = √ (X2 - X1) 2 + (Y2 - Y1) 2

Equation 2 can be implemented into the coordinate form as shown by Equation 3 Ed = √ (Lat 2 - Lat1) 2 + (Lon2 - Lon1) 2 Where: Latitude = Latitude leads from the equator (0) to the south pole, or the equator to the poles North (angle 0-90 and 0 -90). Longitude = longitude is a horizontal line like that of the equator. The corner 0 (Greenwich) towards Hawaii is 0-180, while the opposite is from 0 to -180.

F. Application

An application is a use in a computer, instructions or statements arranged in such a way that the computer can process inputs into output [6].

G. Android

Android is an operating system for linux-based mobile devices that includes operating systems, middleware and applications [7]. Android provides an open platform for developers to create their apps. Initially, Google Inc. Buy Android Inc. Which is a newcomer who makes software for mobile / smartphone. Then to develop Android, the Open Handset Aliance was formed which is a consortium of 34 hardware, software and telecommunication companies, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile and Nvidia. At the inaugural release of Android, November 5, 2007, Android alongside the Open Handset Alliance stated support for open source development on mobile devices.

H. Skala Likert

Likert scale is a scale that can be used to measure attitudes, opinions and perceptions of a person about a particular phenomenon or phenomenon. Research instruments using Likert scale can be created in the form of checklist or multiple choice [8]. Such as determining the location of one's position in a kontinium attitude toward attitude objects, ranging from very negative to positive. For each one statement respondents choose one response in the form SS = Strongly Agree, S = Agree, Hesitate = R, TS = Disagree, STS = Strongly Disagree.

I. Black box Testing

Testing performed only observed the results of execution through test data and functional check of the software. This test is analogous to seeing a black box that can only be seen outside appearance, without knowing what is behind the black wrapper [9].

J. Global Positioning System (GPS)

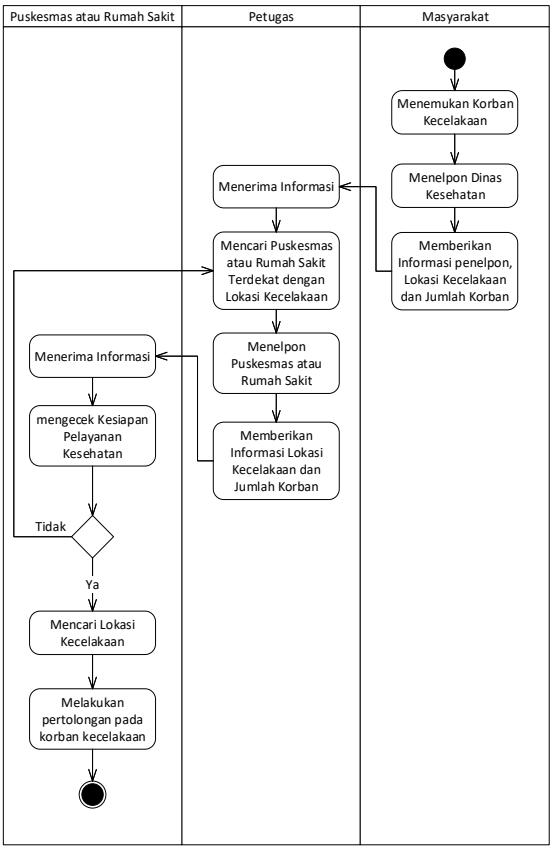
Global Positioning System is a satellite-based navigation system consisting of a network of 24 satellites placed into orbit by the US Department of Defense which was first introduced starting in 1978. GPS services used to be used only for military purposes but began to be open to the public [10].

III. RESULTS AND DISCUSSION

At this stage consists of stages of research conducted. The stage consists of a general overview of the system that will be described in the analysis of procedures on the running system, data analysis, technology analysis and functional requirements analysis. The next stage is to hold the test system using alpha and beta testing.

A. Procedure Analysis On Current System

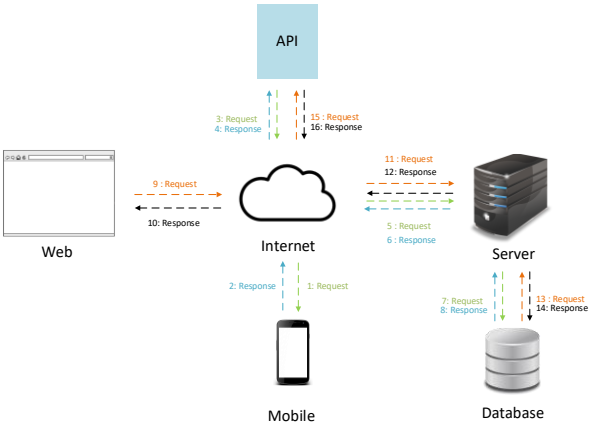
The ongoing system analysis is intended to analyze the system used by the Health Department at this time. The ongoing process related to the process of accident assistance will be explained by the activity diagram as follows:



Picture 1. Activity Diagram In Current System

B. System Architecture Analysis

Phase Analysis System architecture aims to identify the architecture to be built based on two web and mobile systems.



Picture 2. System Architecture

Here is a description of picture 2. system architecture :

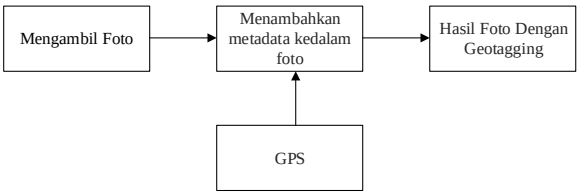
1. *The mobile system makes requests to Firebase APIs and servers over the Internet*
2. *Mobile system Receives response from Firebase API and server via Internet network*
3. *Firebase API receives request data from google account from mobile system via internet network*
4. *Firebase API Provides google account data response to mobile system via internet network*
5. *The server receives requests from the mobile system to transmit crash data over the internet network*
6. *The server provides a response to the mobile system over the internet network*
7. *The server makes a request to the Database to store the crash data*
8. *The server receives a response from the Database*
9. *The web system makes requests to the server and Google Maps API over the internet*
10. *The web system receives a response from the server and Google Maps API over the internet*
11. *The server receives the request data from the web system*
12. *The server provides a response to the web system*
13. *The server does request data to the Database*
14. *The server receives a response from the Database*
15. *The Google Maps API receives requests from the web system when it requires Google Maps services over the internet*
16. *Google Maps API Provides a response to the web system when it requires Google Maps service over the internet*

C. Technology Analysis

Technological analysis aims to identify the capabilities of the technology on which applications will be built. The technology that will be applied in traffic accidents applications this is as follows.

1. *Application of Geotagging Technology*

Geotagging technology is used in the construction of photo tagging application of traffic accident assistance to provide an overview of the accident condition and where the crash site automatically. This technology is applied to mobile android so people can report the accident easily without having to tell long story and explain where the accident location.



Picture 3. Flow of Geotagging Technology

Here is an explanation of the picture 3. geotagging technology flow to be built on android mobile applications :

1. *The public reported the accident by taking photos of accidents using android mobile applications.*
2. *The system will automatically add location metadata into the photo based on the reported location.*
3. *Then got the photo of the accident with additional location information from the complainant.*

Here's how to add information to photo metadata on android:

```
exif.setAttribute(ExifInterface.TAG_GPS_
LATITUDE, latitude);
exif.setAttribute(ExifInterface.TAG_GPS_
LATITUDE_REF, latitude_ref);
exif.setAttribute(ExifInterface.TAG_GPS_
LONGITUDE, longitude);
exif.setAttribute(ExifInterface.TAG_GPS_
LONGITUDE_REF, longitude_ref);
exif.setAttribute(ExifInterface.TAG_MODE
L, model);
exif.setAttribute(ExifInterface.TAG_MAKE
, make);
    exif.saveAttributes();
} catch (IOException e) {
    // TODO Auto-generated catch block
    e.printStackTrace();
}
```

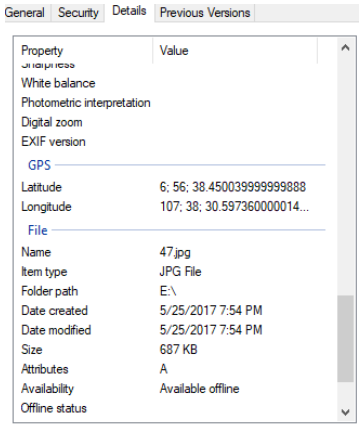
Picture 4. Source Code Application of Geotagging

The following is a description of Picture 4. the geotagging application source code on the android platform:

a. *ExifInterface.TAG_GPS_LATITUDE is used to insert latitude into a photo*
b. *ExifInterface.TAG_GPS_LATITUDE_REF = "S" is used to insert South or south into a photo explaining that southern latitude*
c. *ExifInterface.TAG_GPS_LONGITUDE is used to insert longitude into a photo*

d. *ExifInterface.TAG_GPS_LONGITUDE_REF = "E" is used to insert east or east into a photo explaining that east longitude*

If the process of adding information to the photo metadata is successful then in the details of the photo there will be a tag like the following :



Gambar 5. Hasil Foto Geotagging

2. *Implementation of Euclidean distance*

Euclidean distance is applied to traffic accident assistance applications to get a puskesmas or hospital which has a close distance to the location of the accident. The following is a calculation of Euclidean distance method to determine the distance between accident location with puskesmas with location 1 is accident have latitude -6.896582 and longitude 107.582851 and location 2 is puskesmas with latitude -6.889304 and longitude 107.616829

Is known :

lat1 = -6.896582, lon1 = 107.582851

Lat2 = -6.889304, Lon2 = 107.616829

So the calculations :

$$Ed = \sqrt{(lat2 - lat1)^2 + (lon2 - lon1)^2}$$

$$Ed = \sqrt{(-6.889304 - (-6.896582))^2 + (107.616829 - 107.582851)^2}$$

$$Ed = \sqrt{(0.007278)^2 + (0.033978)^2}$$

$$Ed = \sqrt{0.000052969284 + 0.001154504}$$

$$Ed = \sqrt{0.001207473284}$$

$$Ed = 0.034748716$$

The distance calculation above is still in decimal degree units according to the longlat format used so that to adjust it needs to be multiplied by 111,319 km (1 degree of earth = 111,319 km) So the distance between accident and puskesmas is 0.034748716 x 111.319 = 3.868192316404 or 3.9 Km

D. Functional Needs Analysis

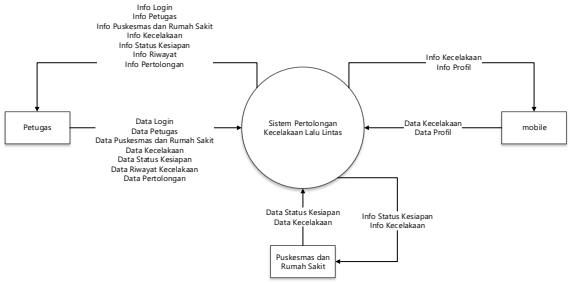
The functional requirements analysis includes 2 platforms, namely the Android Mobile platform for the user interface and the Website platform for the interface to the mobility health service officers of the Health Office, the puskesmas and the hospital. System analysis for web platform includes Context Diagram, DFD divided into several levels and Specification process that serves to explain the flow of data processed. System analysis for the mobile platform is done using UML tools, while the stages of system analysis using UML include use case diagrams, use case scenarios, activity diagrams, class diagrams and sequence diagrams.

1. *Web Functional Requirement Analysis*

This Web Functional Requirement Analysis includes Context Diagram, DFD divided into several levels, Process specification that serves to explain the flow of processed data and data dictionary.

a. *Context Diagram*

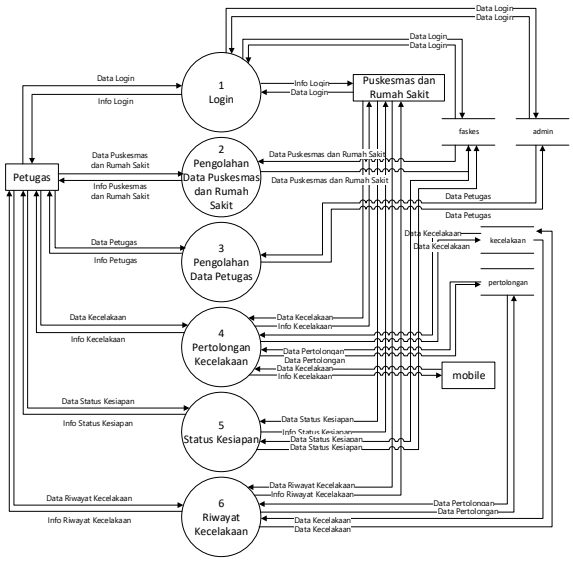
Context Diagram is a diagram that describes in general the input, process and output that occur on a system. Below is Pictre 6. Context Diagram for software to be built



Picture 6. Context Diagram

b. *Data Flow Diagram*

DFD is often used to describe an existing system or a new system that will be developed logically without considering the physical circle where the data is flowing or the physical environment in which the data will be stored. Here is Picture 7. DFD Level 1 of the software to be built:



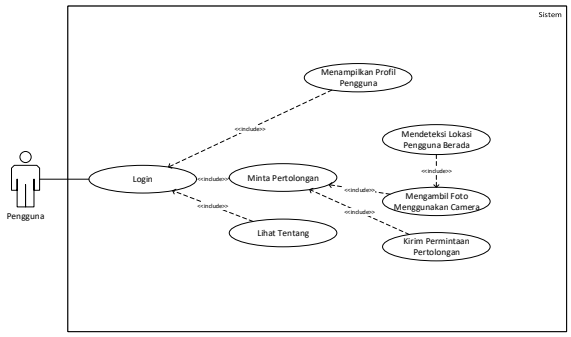
Picture 7. DFD Level 1

2. *Mobile Functional Requirement Analysis*

The analysis of functional requirements of devices in the Android Mobile Platform is done using UML tools, while the stages of system analysis using UML include Use Case Diagram, Use Case Scenario, Activity Diagram, Class Diagram and Sequence Diagram. Requirements analysis of software on Android Mobile Platform will be explained as follows:

a. Use Case Diagram

Use Case Diagram is a construction to describe the relationships that occur between actors with the activities contained in the system. The use case modeling objectives include defining the functional and operational requirements of the system by defining the agreed use scenarios between users and developers. From the analysis of existing application users then Use Case Diagram for devices in the Mobile Platform can be seen in Picture 8.



Picture 8. Use Case Diagram

E. System Implementation

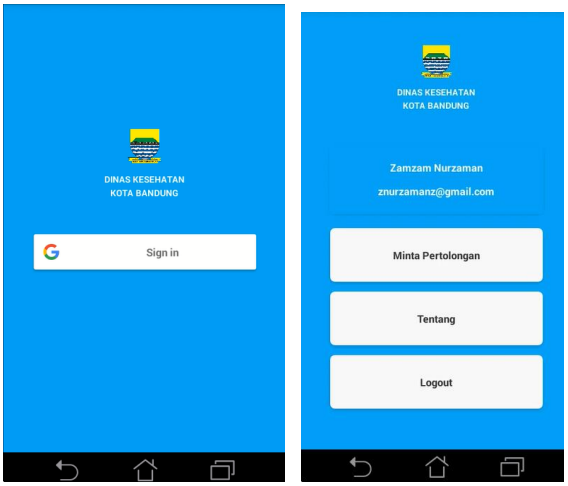
Implementation system is a stage to apply the design that has been done to the system so it is ready to be operated. Implementation of the system includes hardware implementation, software implementation, data implementation, implementation of the interface.

1. Implementasi Antarmuka

Implementation of the interface is done based on each display of traffic accident assistance applications built Display interface implementation that is divided into 3 ie mobile android for the community, the web for mobility health service officers and puskesmas or hospital.

a. Android Mobile Interface

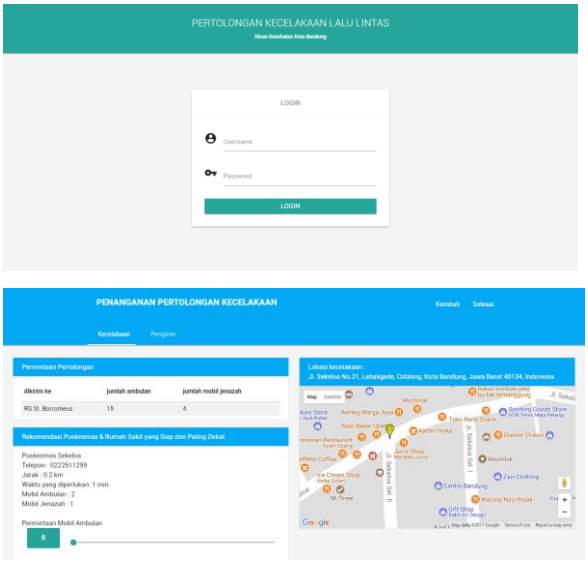
The interface for mobile android can be seen in the following Picture :



Picture 10. Android Mobile Interface

b. Web Interface

The interface for the Web can be seen in the following Picture :



Picture 11. Web Interface

E. System Testing

The next stage is the stage of system testing on traffic accident applications. This stage is the most important thing that aims to find errors or mistakes in the application built. This test intends to determine whether the application has met the criteria in accordance with the purpose of designing the application or not. Testing of traffic accident assistance applications will use alpha testing and beta testing strategies.

1. Alpha Testing

Alpha testing is done by using a black-box method that focuses on the functional requirements of the software. The purpose of this black-box method is to find faulty function in the program. Black-box testing

is done by giving a number of input data to the application which is then processed according to its functional requirements to see if the application is then processed in accordance with its functional requirements to see if the application produces the output used and in accordance with the function of the program. If from the input data provided the process produces output in accordance with its functional requirements, then the application has been made is correct. But if the resulting output does not match the functional requirements, then there is still an error in the application program.

2. Beta Testing

Beta testing is an objective test conducted directly by users who later will use this traffic accident applications are among them health care workers, health centers, hospitals and communities that can do the help of accidents. This research was conducted in Dinas Kesehatan by using interview for health service officer of Dinas Kesehatan. This is done in order to know the extent to which this built application can help and can solve the problem.

Beta testing is done directly to the user software by using data collection method that is the questionnaire to health service officer of Health Department. The method used to calculate the test result is the Likert Scale. The results of the questionnaire can be seen in table 2. The results of the questionnaire as follows :

Table 2. Results of Questionnaire

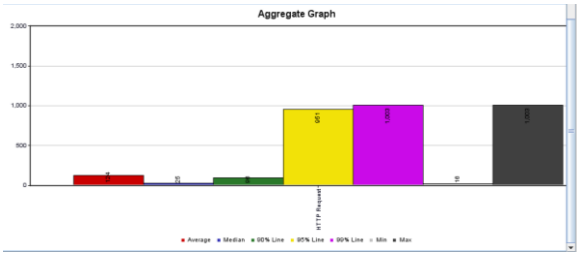
Question One: Do you agree that the built application is easy to operate ?				
SS	*S*	*R*	*TS*	*STS*
1	*5*	*0*	*0*	*0*
Average = (5+20+0+0+0)/30 = 83,33				
Second Question: Do you agree the look / interface of this application is convenient to see and easy to understand?				
SS	*S*	*R*	*TS*	*STS*
4	*2*	*0*	*0*	*0*
Average = (20+8+0+0+0)/30 = 93,33				
Third Question: Do you agree this application can reduce the occurrence of error reporting accident location from the community?				
SS	*S*	*R*	*TS*	*STS*
2	*3*	*1*	*0*	*0*
Average = (10+12+3+0+0)/30 = 83,33				
Fourth Question: Do you agree this application can describe the state of the victim from the community?				
SS	*S*	*R*	*TS*	*STS*
0	*4*	*2*	*0*	*0*
Average = (0+16+6+0+0)/30 = 73,33				
Fifth Question: Do you agree this application can make it easier to determine which health center or hospital is ready and closest to the accident victims?				
SS	*S*	*R*	*TS*	*STS*
3	*3*	*0*	*0*	*0*
Average = (15+12+0+0+0)/30 = 90				

F. Performance Testing

This test is done to determine the speed of data retrieval and data transmission of applications that have been built. Testing is done with the help of Apache JMeter support device. With this application we can simulate how many users will connect to the application. In this test, it is assumed that there are 20 users. Where, the pause between users accessing the app is 1 second.

1. Data Delivery Performance Testing

Here is a picture 12. The performance of data transmission from the data transmission performance graph to the built web service.

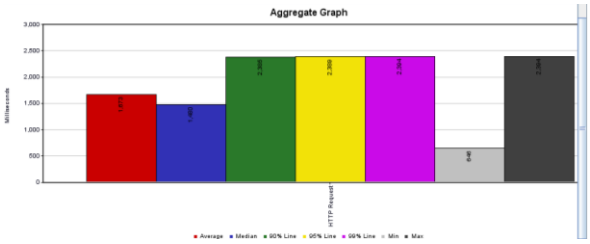


Picture 12. Data Delivery Performance

It can be seen in the graph that the average speed response is 124ms. For the minimum time or the fastest is 16ms and the maximum time is 1.003ms. It can be concluded that the performance of data delivery to web service that is built is good.

2. Test of Relief Handling Performance

The following is a picture 13. Relief handling performance of the aid handling assistance graph built.



Picture 13. Relief Handling Performance

It can be seen in the graph that the average speed of response is 1.673ms. For the minimum time or the fastest is 646ms and the maximum time is 2.394ms. It

can be concluded that the performance of the handling aid that is built quite well.

IV. CONCLUDE

The conclusions and suggestions obtained from the results of this study are :

A. Conclusion

Based on the results of testing traffic accident applications using geotagging technology on the android platform then obtained the following conclusions :

1. *Application of traffic accident assistance built can reduce the occurrence of error reporting the location of accidents and more illustrated the circumstances of the victims of the community so that facilitate health service personnel mobility Health Department take action.*
2. *The application of traffic accident assistance in the built can facilitate health service officers in the health department in determining which health center or hospital is ready and closest to the victims of accidents*

B. Suggestion

Traffic accidents applications that have been built will be better if it continues to be developed. Therefore there are several

Suggestions that can be used as a guide in app development to a better direction. The suggestions are as follows :

1. *Collaboration with the police.*
2. *Added ambulance detection technology on the way to the crash site.*
3. *Developing mobile apps for support on operating systems other than android*

BIBLIOGRAPHY

[1] B. Aria Wardani, "Aplikasi Pencarian Tempat Wisata Kuliner Di Kota Bogor Berbasis Location Based Service Dan Geotagging Pada Android".

[2] A. Mardani, "Sistem Informasi Geografis Pelaporan Masyarakat (Sigma) Berbasis Foto Geotag".

[3] N. Herucahyono, "Studi Penggunaan Data Exif Untuk Mengukur Pengaruhnya Terhadap peningkatan Kinerja Image Search Engine".

[4] G. Friedland, "Cybercasing the Joint: On the Privacy Implications of Geo-Tagging".

[5] F. Falanda, R. Gustriansyah and H. , "Penentuan Objek Wisata, Objek Kuliner Serta Akomodasi Disekitar Pengguna Dikota Palembang Dengan Menggunakan Algoritma Euclidean Distance," 2016.

[6] J. Hartono, Analisis dan Desain Sistem Informasi, Yogyakarta: Andi, 2005.

[7] N. Safaat, Pemograman Aplikasi Mobile Smartphone Dan Tablet PC Berbasis Android, Bandung: Informatika Bandung, 2015.

[8] N. Oktavia, Sistematika Penulisan Karya Ilmiah, Yogyakarta: deepublish, 2015.

[9] R. Hendrowati, Perancangan Pengujian Beroriantasi Objek, Yogyakarta: Andi, 2013.

[10] B. Marjuki, Survei dan Pemetaan Menggunakan GPS, 2016.