Design and Build a Motor Vehicle Information System App using Location Based Service in the City of Malang

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***Abstract*— The service queue system at motor vehicle repair shops in Malang city is still manual, customers must find the nearest repair shop and visit the repair shop then queue for service without knowing the queue information. With a system like that, it will be difficult and take a long time for customers who want to do service. For this reason, we need an application to search for the nearest motor vehicle repair shop based on maps based on LBS (Location Based Service) and a motor vehicle service queue information system using a web server and applications with the Android operating system. The application of the location-based service concept to the workshop queuing information system application can be used to provide location-based information services. Customers will use an application that displays workshop information and the number of service queues according to what is input by the workshop admin. The result of this research is workshop queue information system application can be used to find out the user's location and the location of the nearest special vehicle repair shop around the user. From the experimental results, it is found that the web and application can work well.**

Keywords*— *Location Based Service, Global Positioning System, Information System.

I. INTRODUCTION

Internet and mobile devices in recent years have experienced very rapid development. This is because the human need for information continues to increase. The developers of mobile devices and the internet are also increasingly aggressive in producing a technology that can produce information according to user needs. The technology created is in the form of hardware, namely smartphones and a satellite-based navigation system, namely GPS (Global Positioning System [1]. We need an application to search for the nearest motor vehicle repair shop based on *maps* based on LBS *(Location Based Service)* and a motorized vehicle service queue information system using a *web server* and applications with the *android* operating system [2]. One way to overcome this is we designed an application to search for the nearest motor vehicle repair shop using maps based on LBS (Location Based Service) and an Android-based motor vehicle service queue information system. Location-based service is a location-based service or a general term that is often used to describe the technology used to locate the device the user is using. This service uses Global Positioning System (GPS) technology and the Google Maps Geolocation API. Whereas in the service queue information system, users can find information in the form of the number of service queues at the workshop with the work system of each workshop providing information on the number of queues via the web and users can view this information in an application [3]. Application of the LBS *(Location Based Services)* concept to the workshop queuing information system application can be used to provide location-based information services. Workshop queue information system application can also be used to find out the user's location and the location of the nearest motorized vehicle repair shop around the user [4].

II. METHOD

A. Research Design

In the research design, the author will describe the steps to be carried out in this study which are shown in Figure 1.

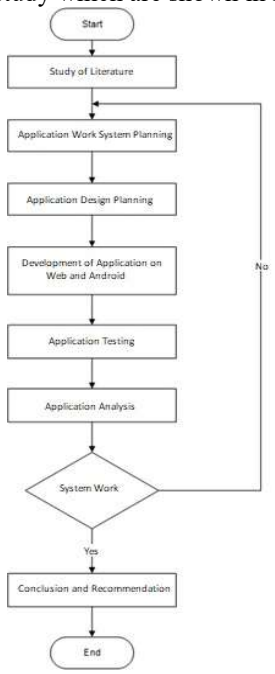


Figure 1. Flowchart of Research Design

The following explains the role of each block in the research design in Figure 1:

1. The first stage is a literature study on Google Maps, Google Maps API, Location Based Service, MySQL programming and Android Studio. At this stage, device specifications, programming used and communication systems in the application are also determined.
2. The second stage is planning the application of the queuing system and implementing location-based services at each motorized vehicle repair shop.
3. The third stage is the design of hardware and software to design a queuing system application.

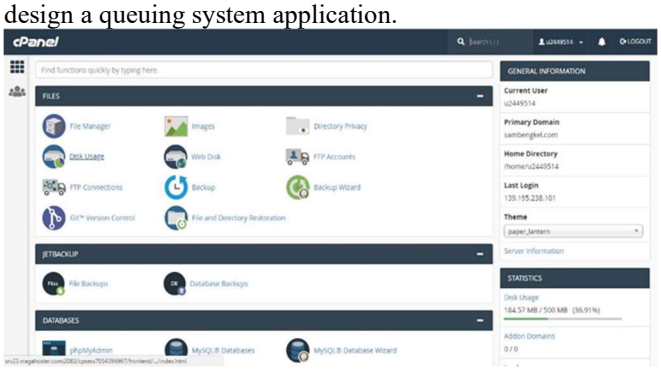


Figure 2. Home cPanel Display

4. The fourth stage is making application programs on Android and the Web, collecting workshop location data from Google Maps and configuring and creating an information system with data on the number of queues and the location of motorized vehicle repair shops in the queuing system application.

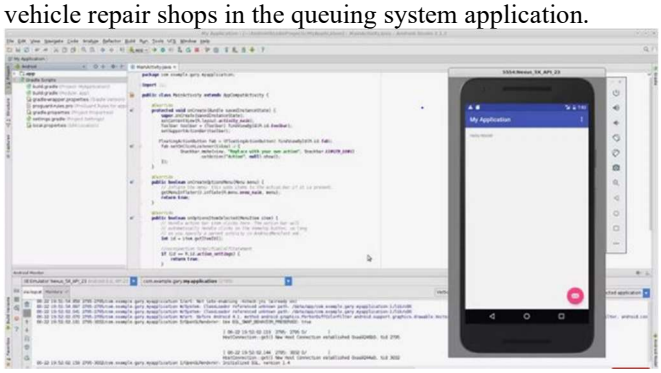


Figure 3. Android Studio Display

5. The fifth stage is the result of system testing whether the application can run as expected or not. If it is not appropriate, it will return to designing applications, developing applications, and implementing location based services. If the device can run as expected, it will continue to analyze the results of the test.
6. The sixth stage is the analysis of the location search work system can run according to the design and the queue information system can work properly, between devices can communicate, between devices can send information to each other.
7. The seventh stage is making conclusions and suggestions from the research results.

B. Model System

1. Overall System Block Diagram

The overall system block diagram that will be made in this study will be illustrated in Figure 4 below:

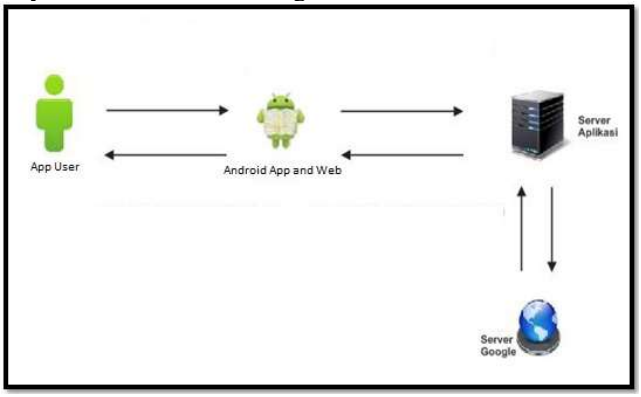


Figure 4. Device Block Diagram

In general, this system consists of:

a. Application Users on Applications

Access the application by entering the identity of the user account and password to get access rights using the application. Then enter customer data in the form of motorbike brands and user locations which are automatically detected in the application, then choose the nearest repair shop from the user area to find out the location of the workshop and information on the motorbike service queue.

b. Application to Application Server

Request for workshop location data in the form of workshop name, map, distance traveled, travel time, address and travel route

c. Application Server to Google Server

Request map data, mileage, travel time and travel route

d. Google Server to Application Server

Send information on the location of the workshop in the form of the name of the workshop, distance traveled, travel time, travel route, address and service queue information.

e. Application to User

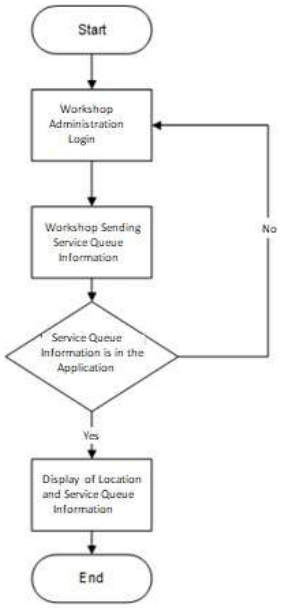
Users get information on the location of the workshop in the form of the name of the workshop, distance traveled, travel time, travel route, address and service queue information.

C. Flow Diagram Work System

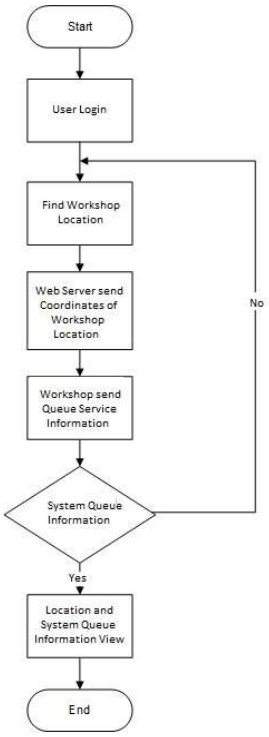
The system to be planned consists of customers and workshop administration. Customer user planning includes finding workshop locations and receiving service queue information. Workshop user administration planning includes sending service queue information to user customers.

This sub-chapter describes the parts of the web display design used. To create a web using CodeIgniter and Adobe Dreamwever. The website that has been created has also previously been hosted on panel.niagahoster.co.id so that it can

be accessed online. To access it by typing sambengkel.com in the web browser url.



a) Workshop Administration Design System



b) Customer Design System

Figure 5. Flowchart Work System

In Figure 5 a, flowchart of the workshop administration system has the following explanation:

1. Workshop Administration login to the application as a user
2. The user sends service queue information data to customers through the application every predetermined period of time.
3. Service queue information will appear in the application so that customers can see the number of service queues for the selected workshop.

In Figure 5 b, workshop administration system flowchart has the following explanation:

1. The customer opens and runs the application.
2. The user searches for the nearest workshop location in the area where the customer is.
3. The user selects a workshop and the Web Server will send the coordinates of the workshop location, route, mileage and travel time.
4. Then the workshop administration will send information on the number of service queues to customers contained in the application.

III. RESULTS AND DISCUSSION

A. Distance Measurement Simulation Testing

1. User Coordinate Testing

Distance testing is used to determine the accuracy of the location of the workshop coordinates. By using My GPS Coordinates application simulation in order to determine and know the Latitude and Longitude of the application user's location. The following is a display of the application used.

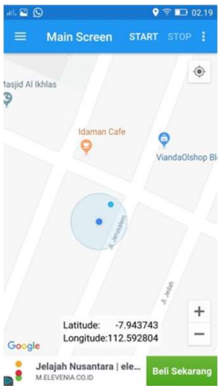


Figure 6. Location display using My GPS Coordinates

Coordinates in the My GPS Coordinates application will appear automatically on the application page according to the user's position. The coordinates displayed are Latitude : -7.943743 and Longitude : 112.592804 while the coordinates displayed in the form of DMS (Degrees Minutes Seconds) are DMS Latitude : 7° 56' 37.4748" S and DMS Longitude : 112° 35' 34.0944" E .

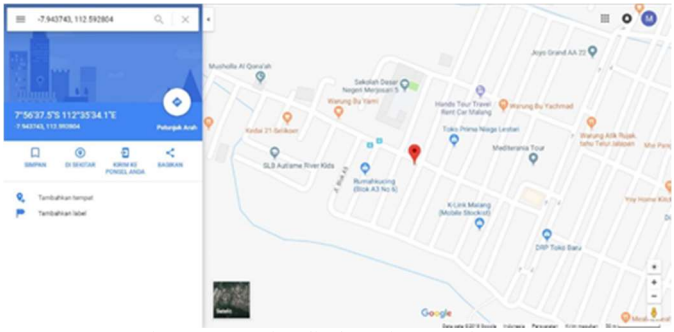


Figure 7. Location display using Google Maps

Coordinates on Google Maps will appear if we right-click on a location in the application. The coordinates displayed are Latitude : -7.943743 and Longitude : 112.592804 while the coordinates displayed in the form of DMS (Degrees Minutes Seconds) are DMS Latitude : 7° 56' 37.4748" S and DMS Longitude : 112° 35' 34.0944" E .

2. Workshop Coordinate Testing

The workshop coordinate test is used to determine the latitude and longitude of the workshop coordinates. The workshop coordinates in the application are entered according to the location of the workshop coordinates on Google Earth. The following shows the location of the workshop.

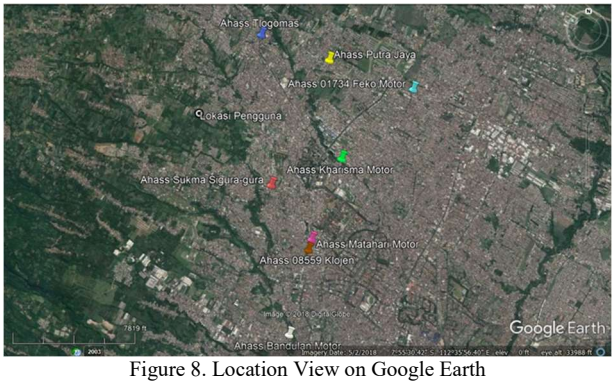


Figure 8. Location View on Google Earth

Workshop coordinate data taken from Google Earth based on predetermined location points will get latitude and longitude coordinates for each official workshop coordinate location in Malang city. The following is the coordinate data for Honda's official workshops in the city of Malang.

TABLE I
HONDA'S OFFICIAL WORKSHOP COORDINATE DATA

No	Workshop Name	User Location : Latitude : -7.943743 Longitude : 112.592804	
		Latitude	Longitude
1	Official Workshop Honda AHASS Putra Jaya	-7.934416	112.615054
2	AHASS SUKMA MALANG Sigura-Gura	-7.957399	112.605944
3	AHASS Tlogomas Motor	-7.930538	112.602667
4	AHASS Matahari Motor	-7.966703	112.613625
5	AHASS Kartika Sari	-7.966181	112.634261
6	AHASS 01734 Feko Motor	-7.938906	112.630277
7	AHASS Asia Sulfat	-7.965791	112.659248
8	Honda AHASS Bandulan Motor	-7.983837	112.610536
9	AHASS Sinar Jaya Motor	-7.949623	112.646695
10	AHASS Sahabat Motor	-7.985974	112.626574
11	Kotalama Motor AHASS 177	-7.988082	112.634862
12	Alim Jaya Motor	-7.937524	112.643943
13	Honda AHASS 08559	-7.968484	112.613169
14	AHASS Adi Jaya Motor	-7.893221	112.666163
15	AHASS Bengkel Tongan	-7.984383	112.627888
16	AHASS Pitoe	-7.979708	112.656807
17	PT. TIARA MEGAH INDAH JAYA	-7.94941	112.639875
18	Kharisma Motor	-7.95201	112.618182
19	AHASS Davi Jaya Motor	-8.00324	112.644211
20	AHASS Sawojajar 13195	-7.980308	112.654063
21	AHASS Pinasthika Mustika Mitra. PT - Basuki Rahmat	-7.977103	112.629093
22	Centratama Honda Ahass	-8.002112	112.630825
23	Agung Motor / Ahass 2712	-7.973647	112.666244

3. Measurement of User and Workshop Coordinates

In measuring the coordinates of the workshop and the coordinates of the user, the distance is calculated using the Google Earth application, namely by drawing a straight line with a description of the distance from the initial coordinates to the destination coordinates. Here are the steps for measuring distance.

a. Determine the distance to be analyzed

Google Maps is used to determine the distance to be analyzed because the application made manually enters latitude and longitude coordinate data obtained based on the location of the workshop coordinates on Google Earth. Distance measurement uses the map scale method, the application shows the map scale which is located below the application on Google Earth.

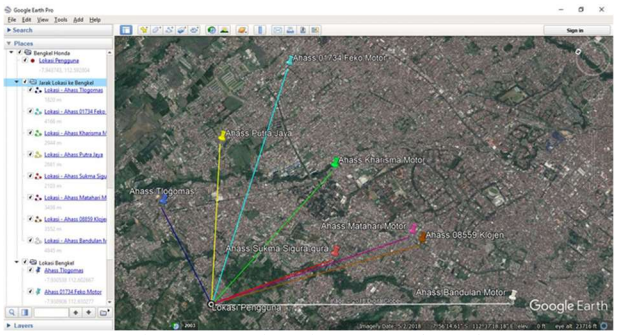


Figure 9. Location View on Google Earth

b. Analysis of the distance at a predetermined location

The user's location is in the coordinates determined according to the location where the user operates the application which is generated in the form of Latitude : -7.943743 and Longitude : 112.592804 while the coordinates displayed in the form of DMS (Degrees Minutes Seconds) are DMS Latitude : 7° 56' 37.4748" S and DMS Longitude : 112° 35' 34.0944" E.

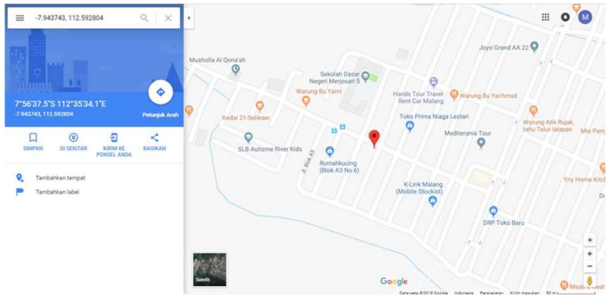


Figure 10. Coordinate View on Google Earth

Workshop coordinate location data in the form of latitude and longitude based on the location taken manually by placing coordinate points on Google Maps will become a database that is entered into the motor vehicle repair queue information system application. The following is a table of the data obtained.

TABLE II
HONDA OFFICIAL WORKSHOP DATA TEST COORDINATE

No	Workshop	Latitude	Longitude
1	AHASS Tlogomas Motor	-7.930538	112.602667
2	AHASS Sukma Sigura-gura	-7.957399	112.605944
3	AHASS Putra Jaya	-7.934416	112.615054
4	AHASS Kharisma Motor	-7.95201	112.618182
5	AHASS Matahari Motor	-7.966703	112.613625
6	AHASS 08559 Klojen	-7.968484	112.613169
7	AHASS 01734 Feko Motor	-7.938906	112.630277
8	AHASS Bandulan Motor	-7.983837	112.610536

Based on the coordinates of the workshop data inputted into the application based on the coordinates on Google Maps, the coordinates obtained are different from the coordinates sourced from Google Earth, causing a difference in the distance between the application and Google Earth.

TABLE III
DATA COMPARISON OF THE DISTANCE TO USER LOCATION

No	Honda Official Workshop (Radius = 5 km)	User Location Distance to Workshop on App	User Location Distance to Workshop on Google Earth	Difference distance App to Google Earth	Difference distance App to Google Earth (m)
1	AHASS Tlogomas Motor	1,800 km	1,820 km	0,02 km	2
2	AHASS Sukma Sigura-gura	2,000 km	2,083 km	0,083 km	83
3	AHASS Putra Jaya	2,600 km	2,661 km	0,061 km	61
4	AHASS Kharisma Motor	2,900 km	2,994 km	0,094 km	94
5	AHASS Matahari Motor	3.4 km	3,446 km	0, 46 km	46
6	AHASS 08559 Klojen	3.5 km	3,552 km	0, 52 km	52
7	AHASS 01734 Feko Motor	4.1 km	4,166 km	0, 66 km	66
8	AHASS Bandulan Motor	4.8 km	4,845 km	0, 45 km	45
Average distance from Google Earth					56.125

Based on Table 2, the radius of the workshop location that can be covered by users is 5 km. It can be seen that there is a difference in the distance between the user's location and the workshop between the Application and Google Earth. The distance obtained according to the calculation is vulnerable between 0.02 kilometers to 0.094 kilometers or 2 meters to 94 meters. We can see that the distance between the user's location and the workshop between the application he made and Google Earth is a significant difference in numbers. Meanwhile, the average difference in distance between the application and Google Earth is 56.125 m.

IV. CONCLUSION

The application of the LBS (Location Based Services) concept to the workshop queuing information system application can be used to provide location-based information services. The workshop queue information system application can be used to find out the user's location and the location of the nearest special vehicle repair shop around the user. The application of the workshop queuing information system and GoogleMaps can be seen that there is a difference in the distance between the user's location and the workshop between the application that has been made and GoogleMaps. The distance that can be according to the calculation is vulnerable between 0.02 kilometers to 0.094 kilometers or 2 meters to 94 meters.

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