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Location Based Services (LBS) for Searching Tire Repair Location in Banjarbaru City Based on Android

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ABSTRACT–The tire repair location is one of the determining factors sought by motorized vehicle users if they are experiencing a tire leak in the middle of a trip. This makes vehicle users panic and think to immediately look for the nearest tire repair location. Banjarbaru City has 5 sub-districts and 12 villages, and is the center of the South Kalimantan Province administration. Given the large number of settlements, especially now that there are many housing complexes in Banjarbaru, this automatically makes the number of new roads opened by the local government. Actually this can be an opportunity for tire repair entrepreneurs to open tire repair locations in several places, because nowadays there are still very few workshops or tire repair locations in the new residential area.Location Based Service System, or better known as LBS, combines the process of a mobile service with the geographical position of its users. The important point is when the target position, where a target might be an LBS user or another entity that is incorporated in a service. This research leads to android based applications and services that provide information of tire repairlocation, to make it easier for motorbike riders to find tire repair locations based on available facilities.

KEYWORD : *android, location based service, motorbike riders, tire leak, tire repair location.*

I. INTRODUCTION

Often the occurrence of tire leaks in the middle of the trip can be caused by many things, such as being hit by sharp objects, the age of the tire is too old, leaking on patch marks, or it could be caused by other factors. This makes the vehicle users panic and think to immediately find the location of the nearest tire repair.

Geographic Information System technology is developing very rapidly, one of which is mobile GIS (Geographic Information System), which was used only in office environments to become more flexible and able to be used outside the office on a mobile basis. Can be used to capture, store, update, manipulate, analyze and display geographic information systems easily (Kusuma, et al. 2013).

The search feature is the most important feature in any application. Especially in conducting a location search on a map, it can be ascertained that the user has difficulty choosing the location point, because it must shift the google / google map map (Rusli, 2016). Google Map API is an interface to make it easier to create applications by utilizing Google maps. Before the research was conducted, there were several related studies that were used as references, including the research conducted by Imam Sugiarto entitled The Nearest Location Search Application for Health Services Based on Android in the City of Yogyakarta. Based on the research, an application was produced which was able to help the community, especially the residents of Yogyakarta, in finding health services with the closest route(Sugiarto, 2013). Other related research is written by Andhika Prakasa Kasma, with the title Utilizing GPS Tracker in Providing Information on Android-Based Applications (Case Study: Trans Jakarta Bus Corridors 6 and 6A. The methodology used in making this application is the waterfall model (Kasma, 2014). Next is the location of garage and

tire repair Geographic Information System in Bandar Lampung City based on Android using the waterfall model software development method (Wibowo & Said Hasibuan, 2016). Then the research entitled GPS and GIS applications to find repair locations in Semarang-based city, android appplication with Dijkstra algorithm(Widyarama, 2015).Then research Android-based Tire Repair Geographic Information System in Purwokerto Region (Lutfi, 2017). Further research from Hamsyah (Hamsyah, 2018)is titled Designing a Go-Ban Application to find and call technicians tire repair using Google Maps API. Then research entitled Utilization of Google Map API on Web-based Department Store Locations Applications, which visualize the path from the place of origin to the department store and equipped with navigation directions, there are also calculations of distances (kilometers) (Dari, Zarlis, & Sembiring, 2013). Next is the research with the title Development of a location-based ATM application system and the nearest gas station based on Android (Sucista, 2012). Andika and Eko Pramono (Slameto & Pramono, 2018)also conducted research under the title Digital Map Innovation Location of Tire Repair Workshop for Smartphones, based on GPS technology.

The results of the researchers' analysis of the research references used by the researchers above is the existence of technological equations that are used to create location-based search applications with Google Map API, but the difference with the above reference research is that in previous studies there has not been any information provided by the workshop, for example, the workshop serves tubeless tires or not, there is nitrogen or not, and it can repair car tires or not.

The city of Banjarbaru has 5 sub-districts and 20 sub-districts, and is the center of the government of South Kalimantan Province. Given the large number of settlements especially now that there are many construction of housing complexes in Banjarbaru, this has automatically made many new roads opened by the local government. Actually this can be an opportunity for tire repair entrepreneurs to open a tire repair location in several places, because nowadays it is still rare to find a workshop or a tire repair location on the new housing.

So the main problem is how to use GIS technology to design a mobile application that integrates GPS technology so that it can be used by vehicle users and tire repairers as a medium that can bring together the owner of a vehicle with a leaky tire with related services, such as workshops and tire repairs.

The purpose of this study is to find the location of tire repair points as well as information about locations and tire repair information / workshops with the nearest route, so that it is expected to be useful for vehicle users if a tire accident breaks or erupts on the road.

According to Linden (1987), Geographical information system (GIS) is a computer system that is used to enter, store, examine, integrate, manipulate, analyze, and display data relating to the positions of the earth's surface (Sutarto, 2015). Positioning on the map uses cartesian coordinates that are stored as a single point x, y. Coordinates are a number used to represent locations on a map (Wartika & Ghoni, 2013).

The global datum is a geodesic datum that uses the selected reference ellipsoid as close as possible (best suited) to the geoid shape for the entire earth's surface (Basofi, 2013). The WGS84 global datum developed by DMA (Defense Mapping Agency) represents earth modeling. GPS uses this global datum as a datum to determine three-dimensional positions of specified targets.

Location-Based Service System, or better known as Location-Based Service (LBS), combines the process of mobile services with the geographical position of its users (Sucista, 2012). The important point is when the target position, where a target might be the LBS user it self or other entities incorporated in a service. Location Manager (API Maps) Provides tools or sources for LBS, Application Program Interface (API). With Location Manager, the current location can be determined, track movement or displacement, and proximity to a particular location by detecting displacement (Kusuma et al., 2013).

Android is a Linux-based operating system that includes operating systems, middleware, and key applications (Sugiarto, 2013). Android provides mobile map support and location services that contain flexible map displays and easy-to-use control functions (Xianhua, Zhenjun, & Rong, 2009).

GPS (Global Positioning System) is used to determine the location on the surface of the earth with the help of satellite signals. The signal is received by the receiver on the surface and is used to determine the location, speed, direction, and time (Santoso, 2016). In conducting a GPS survey, the observation strategy plays an important role in achieving good quality from the position of GPS points. Observation strategies related to the observation method that must be optimal are seen in terms of accuracy, cost and time (Riyanto, 2010a). Accuracy of position in a few meters (not high precision) and generally only intended for navigation needs (Winardi, 2010).

The data handled by GIS is mostly spatial data, which is a geographically oriented data, has a specific coordinate system as its reference base and has two important parts, namely location information (spatial) and descriptive information (attributes), which distinguishes different spatial data from data others (Prahasta, 2009). Attribute data is data that describes the characteristics or phenomena contained in a data object in a map and does not have a relationship with geographical position. Attribute data can be in the form of numerical information, photos, narratives, etc., which are obtained from statistical data, field measurements and censuses, etc. (Pratama, 2018).

Google Maps offers maps that can be shifted (panned), enlarged (zoom in), reduced (zoom out), can be replaced in several modes (map, satellite, hybrid, etc.), route search features (routing), directions from a map object to another object (direction), and also place(Riyanto, 2010b).

II. METHOD

The following are the stages of research carried out :

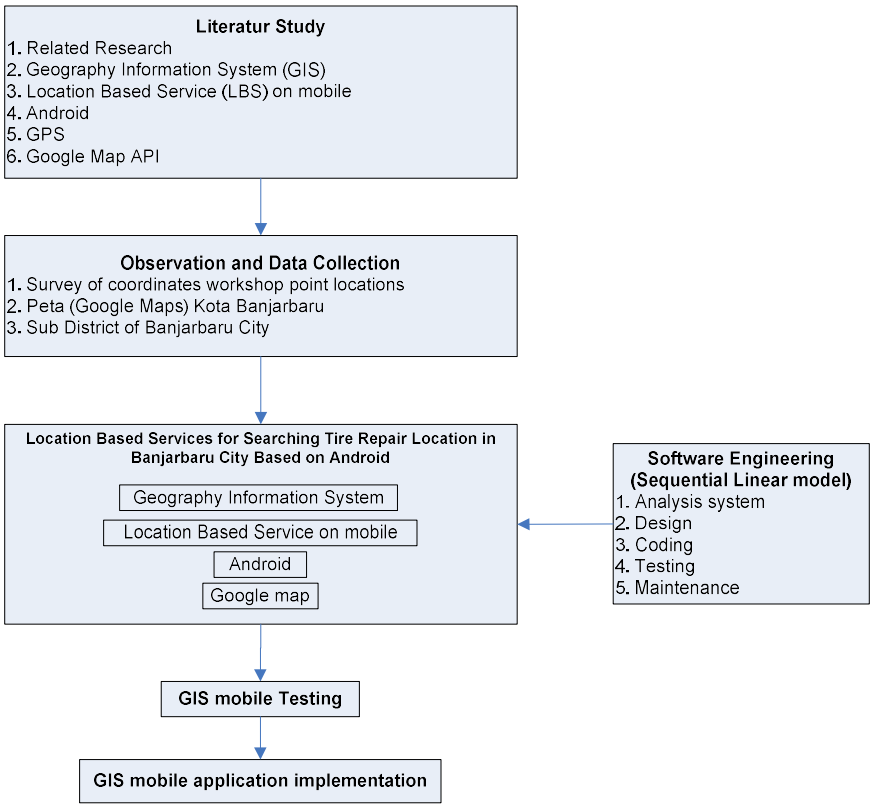

Figure 1 Phase of Research Design

1. Literature study is carried out by studying and understanding the theories used, namely looking for factors that are requirements for geographic information systems (GIS),

location-based service systemtheory on mobile devices, Android theory, GPS and Google Maps APIs. These data are sought by collecting literature, journals, browsing the internet, and readings that are related to the topic, either in the form of textbooks or papers.

2. Observation is carried out by conducting research and direct review of the problems taken to obtain accurate data on Banjarbaru City map data, coordinating locations for tire repairs and workshops, as well as interviewing vehicle user needs for GIS and the relevance of location-based services with GIS.

3. Results from literature studies and observations found data needed for GIS, map data of Banjarbaru City, coordinates of tire repair locations/workshops. Furthermore, the development of Geographic Information System information on the location of tire repairs in the City of Banjarbaru by utilizing GPS technology, while the method used to design the system is to use the UML (Unified Modeling Language) design, UML is a language based on graphics/images to visualize, specify, build , and documentation of an OO (Object-Oriented) software development system(Rismayani & SY, 2017). In software engineering using a linear sequential model with attributes from tire repairs/workshop data location and tire repairs contact's information, and implementing a location-based service system whose results are displayed on mobile devices.

4. The next stage of the results of software development is conducted by the Banjarbaru City tire repair/workshop location GIS by means of operating the system repeatedly.

After the software engineering testing phase is complete, the next step is to implement the results of a system test that will be used by motorbike/car drivers and tire/workshop repair owners in Banjarbaru City.

The system testing technique used is black box testing technique, this testing is used to test the functional of the system, both the system functions and buttons/buttons of the system (Rismayani & SY, 2017).

2.1 *Research sites*

The research location is the tire patch and workshop, as the location coordinates.

2.2 *Method of collecting data*

Data collection methods used in this study :

a. Interview

The method of collecting data is by holding question and answer sessions that are conducted directly to tire patch owners and workshops in Banjarbaru related to the facilities provided, for example, if there are garage facilities, there are also tubeless tire patches, etc. that will become attribute data of tire patch object.

b. Observation

Data collection through observation and recording of the coordinate points (point) of patch/workshop locations along with attribute data. Observations were made directly by observation in 5 sub-districts of Banjarbaru city, which consisted of 20 sub-districts.

c. Literature review

Data collection by reading and studying documents, literature, journals, and books related to the object of research. To get a theory/concept/generalization that can be used as a theoretical basis and framework in research, and to find an appropriate methodology and compare existing theories with facts that occur in the field.

2.3 *Data Processing Method*

The data used in this study:

1. Spatial data, namely x coordinates and y coordinate location of tire repairs/workshops.
2. Data collected attributes, namely the name of the village, the name of the workshop, the name of the owner, No. HP, facilities, opening/closing hours, photos of the location.

While the data collected was 143 tire/workshop patch coordinates in 5 sub-districts(Kecamatan) divided into 20 sub-districts (Kelurahan).

Table 1 Data on Kelurahan and Kecamatan in Banjarbaru

NO.	*KECAMATAN*	*KELURAHAN*
1	*Banjarbaru Selatan*	*Guntung Paikat (Kodepos : 70713)*
2		*Kemuning (Kodepos : 70714)*
3		*Loktabat Selatan (Kodepos : 70714)*
4		*Sei/Sungai Besar (Kodepos : 70714)*
5	*Banjarbaru Utara*	*Komet (Kodepos : 70714)*
6		*Loktabat Utara (Kodepos : 70714)*
7		*Mentaos (Kodepos : 70714)*
8		*Sei/Sungai Ulin (Kodepos : 70714)*
9	*Cempaka*	*Palam (Kodepos : 70731)*
10		*Bangkal (Kodepos : 70732)*
11		*Cempaka (Kodepos : 70733)*
12		*Sei/Sungai Tiung (Kodepos : 70734)*
13	*Landasan Ulin*	*Guntung Payung (Kodepos : 70721)*
14		*Guntung Manggis (Kodepos : 70724)*
15		*Landasan Ulin Timur (Kodepos : 70724)*
16		*Syamsudin Noor (Kodepos : 70724)*
17	*Liang Anggang*	*Landasan Ulin Barat (Kodepos : 70722)*
18		*Landasan Ulin Tengah (Kodepos : 70723)*
19		*Landasan Ulin Selatan (Kodepos : 70724)*
20		*Landasan Ulin Utara (Kodepos : 70724)*

Table 2 Attributes Data of Tire Repair Location/Workshop

No.	Sub District	Workshop Name	Owner	Handphone Number	Facilities	Operating time	Coord.X	Coord.Y	Photo
1.	Landasan Ulin Tengah	Bengkel Yulianto	Yulianto	0816 4515 XXXX	- Motor Tire Patch - Tubeless - Service - Sparepart	08.00 - 19.00	-3,444077 83436259	114,7400 50546824	
2.	Landasan Ulin Tengah	Zainudin Motor	Zainudin	0812 5312 XXXX	- Motor tire patch - Tubeless - Service - Sparepart	08.00 - 17.00	-3,444190 28360774	114,7399 64045584	
3.	Landasan Ulin Tengah	Sulawesi Motor	Rahmad	0853 4836 XXXX	- Mobil tire patch - Service - Sparepart	08.00 - 16.00	-3,449575 78688399	114,7364 86896872	
4.	Landasan Ulin Tengah	Bengkel Isur	Isur	0821 5022 XXXX	- motor tire patch - Service - Sparepart - Nitrogen - Toilet	08.00 - 17.00	-3,443139 41750335	114,7227 30517387	

Retrieving the location data of workshop coordinates cannot be said to be 100% accurate, the distance traveled can be closer or farther. This has been done in a Hamman study (Bimmo et al. 2017) which conducted a comparison of motorcycle mileage measurements between Google Maps, and a microcontroller-based GPS module. The test results concluded that there was a percentage error, but it did not reach 5% and was fluctuating.

2.4 *Questionnaire Testing Techniques*

Questionnaire testing techniques are conducted to test the quality of software design (Ladjamuddin, 2006) by referring to the following functions: aspect availability, namely system testing that can work 24 hours per day, reliability, namely checking links related to tire patch/workshop information, ergonomy namely to provide an attractive and user friendly design for system users, namely motorbike riders and

tire patch owners, portability, which is a system capable of running on various types of android mobile phones, memory, which is large storage, response time, the system can always update information regarding location search tire patches displayed on the Google Maps API, safety and security, namely security from system accounts on admin access rights.

Furthermore, questionnaire testing was conducted on users, namely motor vehicle users and workshop/tire patch owners, where there were 12 questions given to 20 respondents, namely motor vehicle users who happened to be in a workshop spread in several places in Banjarbaru City using the following formula:

$$P = \frac{M}{N} \times 100\% \quad (1)$$

Information :
M = Number of respondents' answers for each question
N = Number of respondents
P = percentage value
With a range of ratings as follows

Table 3 Range of Valuation

No.	Grade	Information
1.	4	Very Helpful
2.	3	Helpful
3.	2	Quite Useful
4.	1	Useless

Figure 2 of system flow design, explains about vehicle rider who are experiencing tire leaks or low tire searches where there is a location for the tire repair or the nearest workshop using a smartphone. Then open the Android mobile application on the system, vehicle rider can choose the location of the tire repair or the nearest workshop and see workshop information. After selecting the tire repair location, it will be displayed on the Google Maps where the position of the vehicle and the route traveled to the location of the tire repair.

III. RESULT AND DISCUSSION

Based on the results of observations, the results and discussion of the research that has been carried out is :

3.1 *System Flow Design*

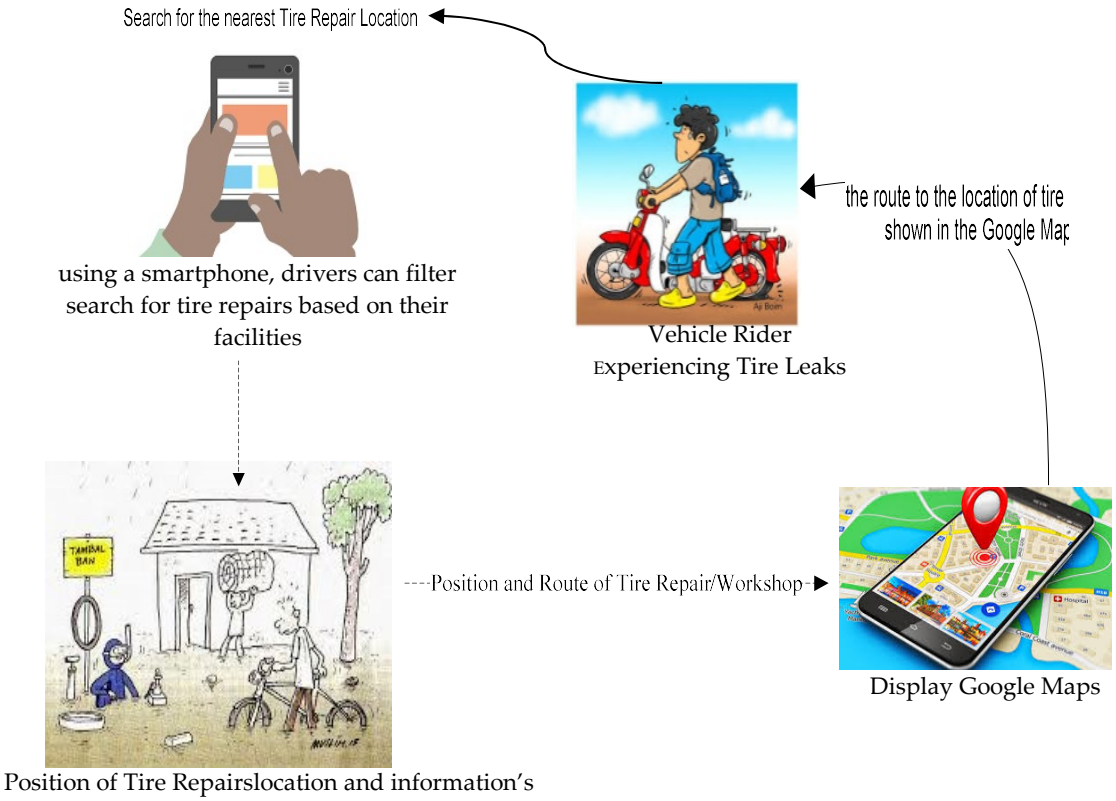

Figure 2 System Flow Design

3.2 *Use Case Diagram*

Flow of use case diagram from the search system for tire patch locations where there are 2 actors, namely motorbike riders and admin. Admin here as a user who can process spatial data of tire repair/workshops location, and input the information in the form of a workshop name or tire patch, what is the name of the owner, cellphone, photo of the workshop, what facilities the workshop has and when opening and close the workshop. The facilities available here are given the choice, namely: is there a patch of car tires too or just a motorbike, is there a tubeless tire facility, is there nitrogen, then whether the workshop's opening time is full 24 hours or not. The difference between admin actors and vehicle users actors here is their access rights, the admin can input and delete data (if the workshop owner moves his workshop location), while vehicle users can see the location and can filter searching by kategories of facilities information.

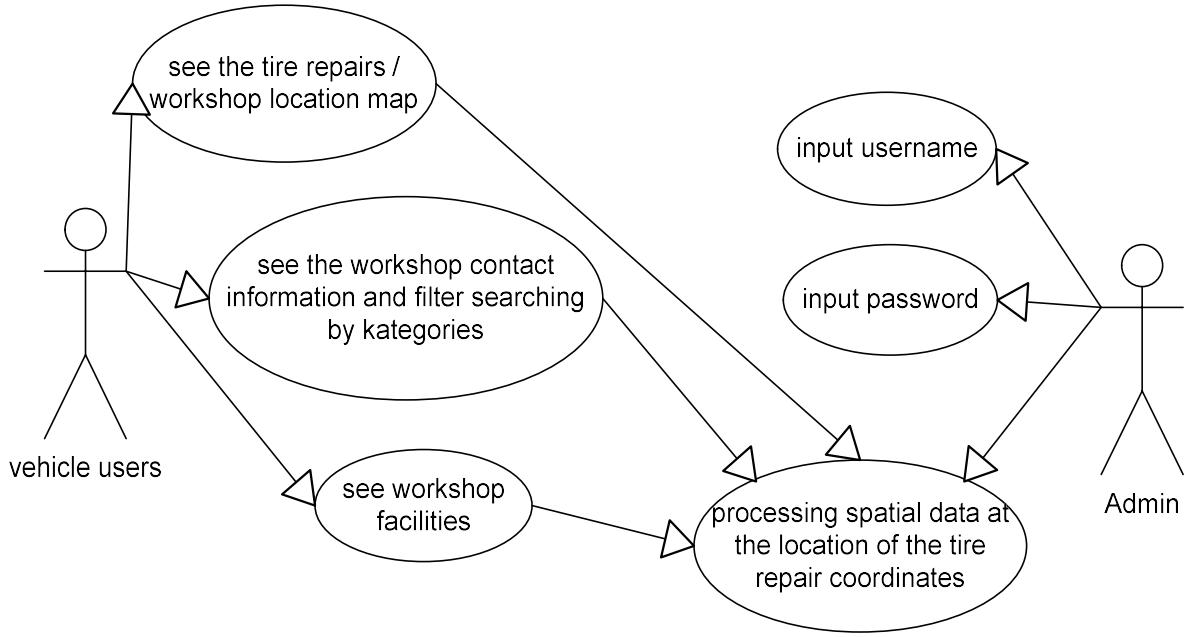

Figure 3 *Use Case* Diagram Sistem

3.3 *Sequence Diagram*

Sequence diagrams or activity diagrams of bikers, where there are several objects, namely actors from motorbike riders,application objects, patch tire location map maps and Google Maps maps. From this activity, the motorist opens the system application then chooses to proceed to the map to see the map of the tire patch location, then the user sees where the closest tire patch position is, and chooses it. From the selected tire patch, motorists can see the workshop facilities. After selecting the tire patch location, the route to the location can be displayed by going to Google Maps.

3.4 *Activity Diagram*

In Figure 5 describes the activity diagram of the system where the activity is carried out, namely choosing the location of the nearest tire patch, then looking at the tire patch information selected, then showing the tire patch location map and displaying the route from the driver position to the selected tire patch location.

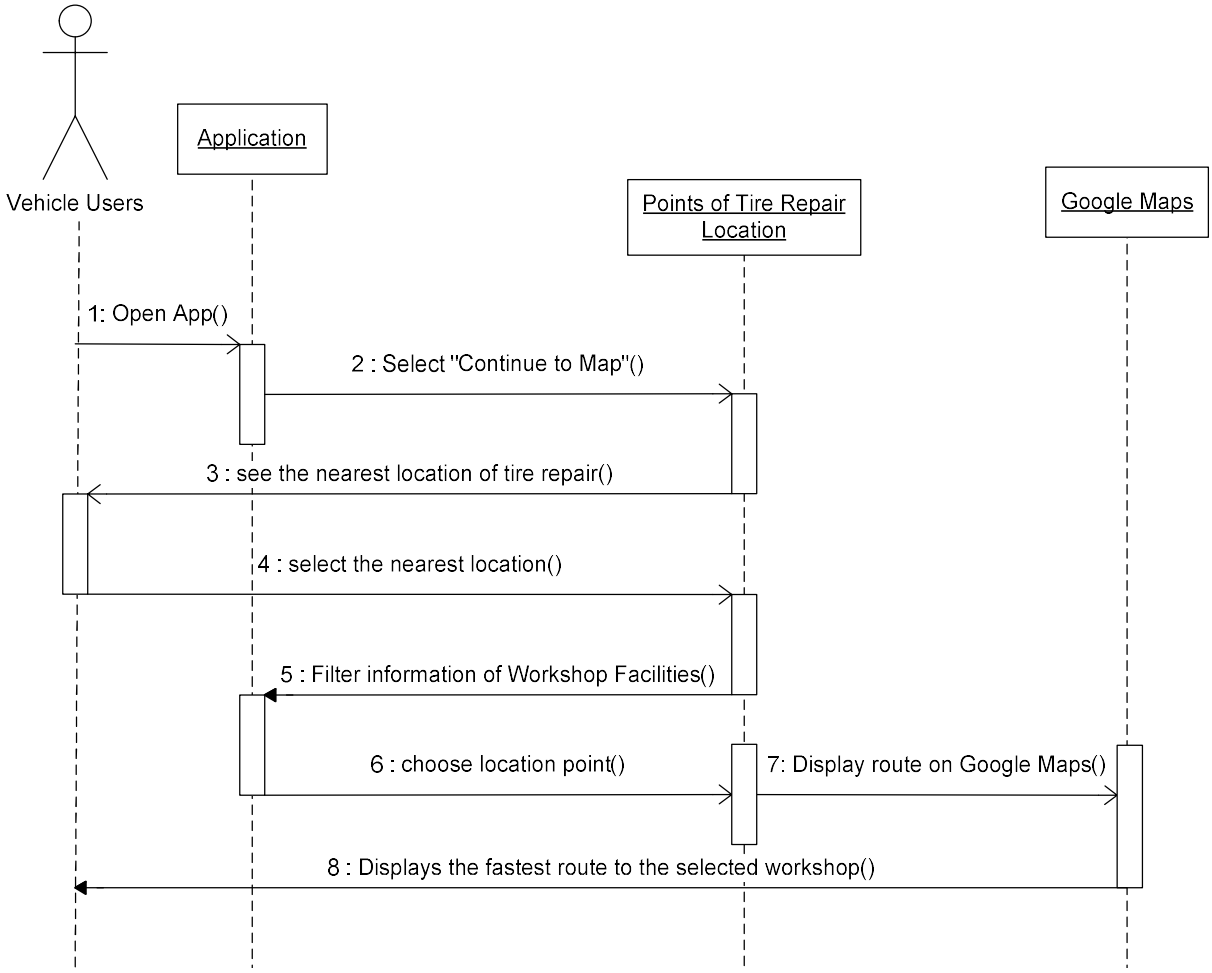

Figure 4 Sequence Diagram

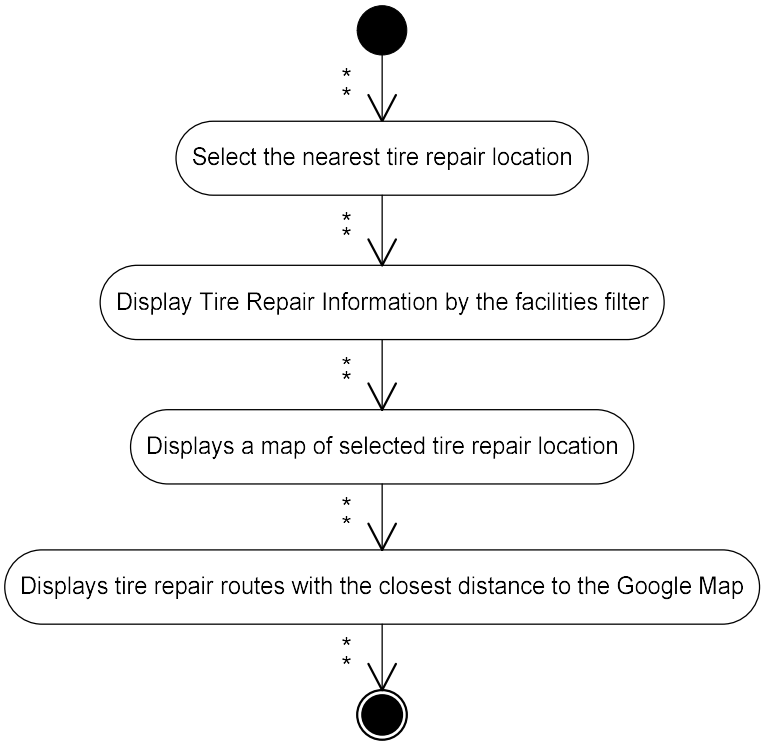

Figure 5 Activity Diagram

3.5 *User Interface Form*

1. The Main Menu Form

Figure 6 Main Menu Form

Explain the appearance of the main menu interface of the Tire Patch Location application. If as a user it will go directly to the Next Go to Map option, and display the location of the tire repair/workshop, but if as an admin, you can choose the Login button to manage the system. If the user wants to exit the main menu or exit the application, there is a notification as follows:

Figure 7App Exit Notification Form

2. Login Form

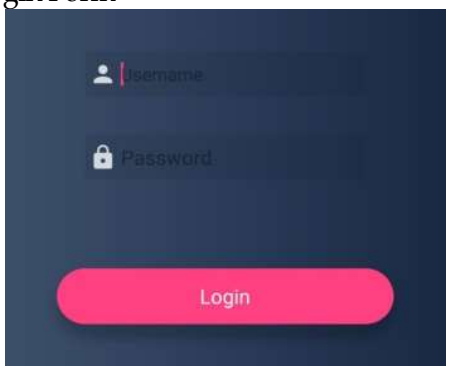

Figure 8 Admin Login Menu Form

In addition to location data, so that the added data can be maintained, the validity level requires a mechanism to control the data entered by the admin. As a control, in this system the admin is required to use the account for the authentication process. This is the display from the login form menu for the admin. There is a menu for inputting your username and password. If the username or password is entered incorrectly, a notification will appear as follows:

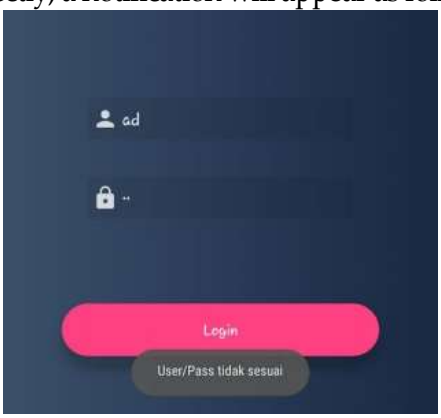

Figure 9 Notification Form If Login is Wrong

3. Form Access Rights As Admin

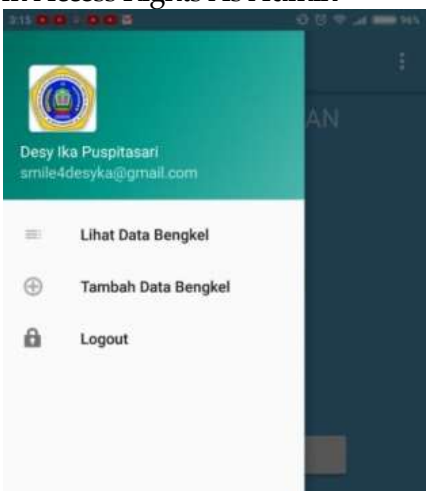

Figure 10 Admin Access Rights form

Explain the appearance of access rights as an admin, there are facilities to view workshop data also process workshop data, by adding workshop data and removing workshop data.

4. Form Add Tire Repair Workshop Data

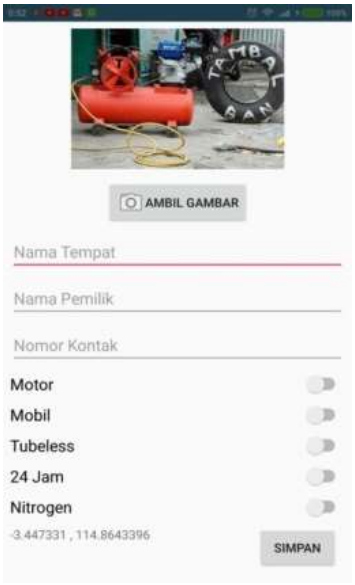

Figure 11 Add Tire Repair Workshop

Explain the addition of workshop data. The location of the coordinates of the tire patch point is automatically filled with the use of GPS technology. Furthermore, filling in tire patch information, such as patch tire photos can be done by selecting the capture button, then inputting the place name, the name of the tire patch owner, contact number and choosing what facilities are there. Are there only motorcycle tire patches, is there also a car tire service, is there nitrogen, are there tubeless tires, is there nitrogen, and is there a 24-hour tire patch service.

5. Access Rights as a Vehicle Driver

Figure 12 Access Rights as a Motorbike Rider Form

If the application user is a motorbike, then the user can only see the tire repair/workshop location with the Continue to Map option button.

6. Filter Search by Facilities Form

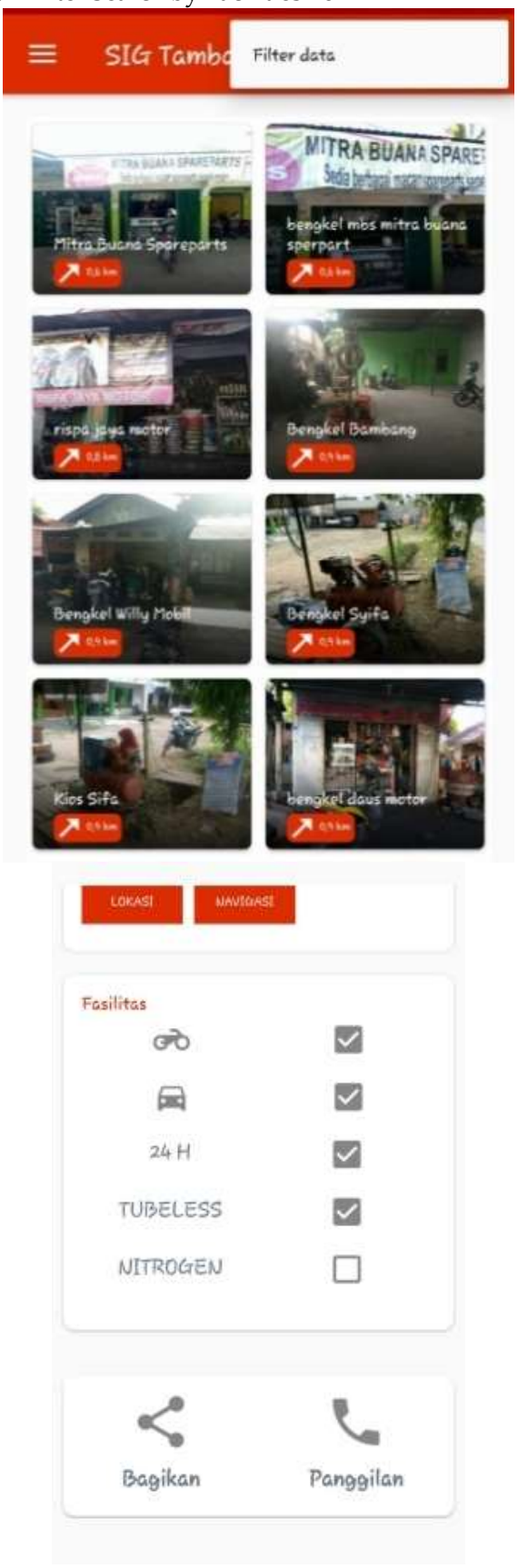

Figure 13 Filter Search by Facilities and Detail

If the admin has added the tire patch location data and the photo, then the tire patch data (will be sort by the nearest distance) displayed on the photo display menu of the tire patch and the details of the workshop facility.From this menu, there is also a logo share to share the location, and the telephone logo if the driver will immediately contact the tire repairman.

7. Workshop Facilities Form

Figure 14 Workshop Facilities Form

Explain the appearance of a workshop/tire repair facility if it meets its facilities, it will be given a check mark in the selection box.

8. Form of Tire Repair Location points

Figure 15 Display of Tire Repair Location Points

Figure 15 above explains the appearance of tire patch or workshop location points on the Google Map API, select one of the tire patch locations, the info window will appear in the form of the name of the tire patch / workshop and the patch tire / workshop contact.

9. Form of Tire Repair Location Point with instructions validation

Figure 16 Tire Repair Location Points

If the workshop location is chosen by the user, a notification will appear "Press the marker again for detailed information" then the system will go to the tire patch facility to see the details of the facility. In figure 16, the user location area is marked with a red colored point, and the location of the tire patch is marked with a blue point.

10. Form of The Nearby Route Tire Repair Location with Object Reach

Figure 17 explains if the user (in the picture is marked with a red point) will go to the tire patch location with the route, then choose the location of the nearest tire patch then click the lower button with the direction symbol in the

right corner, then the system will display directly into the Google Map form.

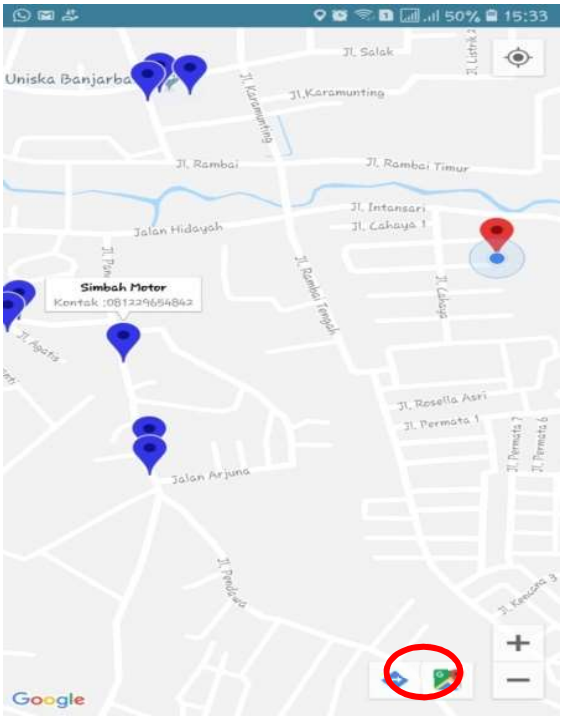

Figure 17 Display Button for Towards Tire Repair Location

11. Form of the Nearby Route Tire Patch Location with Object Reach

Figure 18 is a view to the Google Map to show the direction / route the user must go to the nearest tire patch location. The map also shows the fastest distance and time to get to the location.

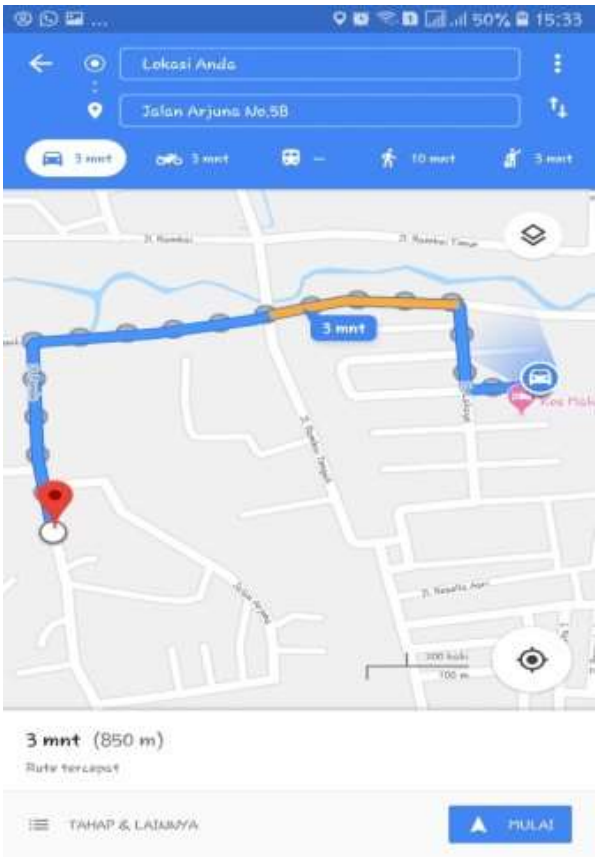

Figure 18 Display Routes from Location of Origin to Location of Tire Repair

3.6 *Black Box Testing System Results*

Based on the black box testing system that has been done, then in general the results of application testing can be concluded as follows:

Table 4 Black Box Testing System Result

No.	Scenario Testing	Expected Results	Conclusion
1.	Admin Login	Successfully logged into the system, access rights as Admin. If it doesn't work, a notification or login system validation will appear.	Valid
2.	Add Workshops Data	Successfully add workshops	Valid
3.	Displays tire repair/workshop location data	Successfully displays the location of the tire repair/workshop along with instructions for use. There is a hint of instructions to see tire patch information in more detail.	Valid
4.	Exit the application	Display usage instructions notification if you want to exit the application.	Valid

The non-functional testing results are summarized as follows :

Table 5 Non Functional Testing

No.	Parameters Testing	Expected Result	Information
1.	Availability	The system can run for 24 hours per day.	Success
2.	Realibility	Links related to information about the location of tire patches and photos of the location of tire patches are as expected.	Success
3.	Ergonomy	The system design is simple and convenient for users, namely for admin and motor vehicle users.	Success
4.	Portability	users of the tire patch search system can use it on any Android mobile device.	Success
5.	Memory	Requires less memory in the system.	Success
6.	Response Time	The system is able to update the latest information on average 5 seconds.	Success
7.	Safety / Security	There is a user id feature and password for the admin login.	Success

3.7 *Questionnaire Examination Results*

From the questionnaire results as the following results:

Table 6 Average Percentage of Questionnaire

Alternative Answers	Average Percentage
Very useful	75
Useful	15
Quite useful	10
Useless	0
Total	100

From table 6 describes the results of calculating the average percentage of the 20 respondents where 75% said it was very useful, 15% useful, 10% quite useful and 0% useless. More details can be seen in the following graph :

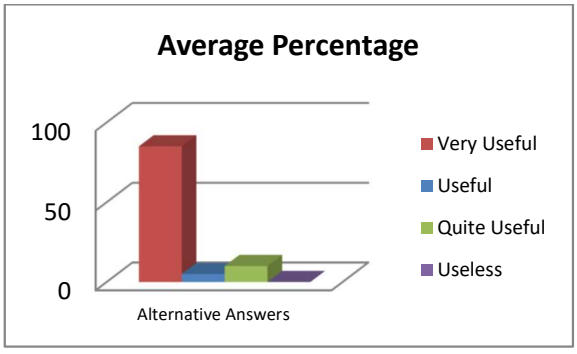

Figure19Graph of Average Percentage Questionnaire Results

The picture above explains the graph form of the questionnaire that has been distributed to motorists which is seen in the red beam image, with very useful information that was chosen by the respondents.

Based on the results of the questionnaire that has been obtained stating that the geographic information system application searches for tire patch locations is very beneficial for the community users of the application, so people are greatly helped by the system, plus a flat tire or leaky tire in an unknown location where there is a location tire repairs. Location Based Services (LBS) for Searching Tire Repair Location in Banjarbaru City Based on Androidprovided a solution for the people of Banjarbaru City so that they would know the location of the nearest tire repair/workshop location.

3.7 *Conclusion*

Location-based service applications for locating tire patches can be used by motorists to go to the tire patch / workshop location when they experience a tire leak. Possible workshop information in this research is when the workshop operates, whether or not nitrogen facilities, tubeless tire patches, can repair motorcycle tire patches or car tires can also be accompanied by workshop owner contacts, so that drivers who have tire leakage/flat tires can directly contact the nearest tire patch. For workshopowners this

application can indirectly help promote its business.

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