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Development of a Survey Instrument Mobile App to Determine the Map Location of a Drugstore

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Abstract

Background : WHO estimates that more than half of all drugs in the world is prescribed, administered and sold inappropriately and half of the patients use drugs inappropriately. Illegal drug trafficking is a serious problem which is not only happening in Indonesia, but also global. Most people in Pekalongan Regency do not know the location of pharmacies in the area where they live, so to realize an android-based pharmacy application, surveyors need a digital maps-based survey application because the area of Pekalongan Regency is ± 836.13 km2.
Aim & Objectives : Build an android-based Pharmacy Survey Instrument application to Determine the Map Location of a Drugstore that can be used by surveyors in registering pharmacies in Pekalongan Regency.
Methods : This type of research is research and development with four steps to design an application-based pharmacy survey application on android. System development using the waterfall method. The waterfall method is also called classical cycle or linear sequential. This model requires a sequential and systematic system in system development.
Results : The result of this research is the creation of an Android-Based Pharmacy Survey Instrument Application to Determine Pharmacy Location Maps that can be used by Surveyors in registering Pharmacies in Pekalongan Regency. The results of black box testing show that the application works well.
Conclusions : The application can be used by researchers to develop applications that provide the locations of pharmacies in Pekalongan Regency, that can be used by people in Pekalongan Regency to know the location of the pharmacy and the route to the pharmacy to buy drugs officially.
Keywords : Surveys, Software, Mobile app, Map, Drugstore

BACKGROUND

The Ministry of Health of the Republic of Indonesia with the vision of "an independent society for healthy living" and the mission of making people healthy, seeks to facilitate the acceleration and achievement of the highest health status for all Indonesian people(1). WHO estimates that more than half of all drugs in the world is prescribed, administered and sold inappropriately and half of the patients use drugs inappropriately. Drugs are substances that are used for the prevention and cure of disease as well as the recovery and improvement of health for its users(2). Each drug has benefits, but also has adverse side effects. Therefore, use the drug according to the instructions for use. Buy medicine at official facilities such as pharmacies, licensed drug stores, clinics and hospitals(3).

The rampant circulation of counterfeit and expired drugs must be watched out for because it makes people anxious. For this reason, the Food and Drug Supervisory Agency urges the public to be selective and careful in buying drugs(4). Medicines must be purchased at authorized pharmacies. The distribution of drugs is actually clear, namely through official pharmacies. The circulation of counterfeit and illegal drugs is widely circulated on unofficial channels. In addition, the weak supervision of distribution facilities causes the quality, safety, and efficacy of drugs to be not guaranteed, the public as consumers is not protected(5). People should buy drugs at official drug stores, not in unknown places. In official places such as pharmacies because the person in charge is a pharmacist. The public needs to know the characteristics of counterfeit drugs. Counterfeit drugs are usually sold at lower prices and the distribution license number is changed(6).

Illegal drug trafficking is a serious problem which is not only happening in Indonesia, but also global. According to the Reports collected by WHO that drug counterfeiting is widespread types, ranging from cancer drugs to contraceptives, expensive drugs, well-known brands, patents, nor generic(7). No country is unaffected by fake medicines. What was once considered a danger limited to low- and middle-income countries has become a global issue. The rise of the internet and access to manufacturing equipment has made it easier than ever for illegal distribution to happen on a large scale(8).

The risk from fake medicines continues to be higher in low- and middle-income countries where the World Health Organization (WHO) estimates that one in ten medical products are fake or sub-standard. People living in countries with weak, non-existent or inaccessible health systems or in areas of conflict or unrest, where medicines may not

be readily available, are more likely to turn to alternative suppliers who may put their health at risk. Each year, an estimated 250,000 children around the world die as a result of fake malaria and pneumonia drugs alone. Low-quality or counterfeit vaccines, antibiotics and medical equipment contribute to further deaths(8).

Most people in Pekalongan Regency do not know the location of pharmacies in the area where they live, so to realize an android-based pharmacy application, surveyors need a digital maps-based survey application because the area of Pekalongan Regency is ± 836.13 km2(9). The rapid development of android-based technology is also in line with the increasing use of these handsets. The reason people use Android-based handsets is to make it easier for users to access information. Access to this information includes access to news info, access to social media, access to health, and various other information needs. Utilization of information technology, media and communication has changed both the behavior of society and human civilization globally. The development of information and communication technology has also caused world relations to become borderless and caused significant social, economic and cultural changes to take place so quickly. Information technology is currently a double-edged sword because in addition to contributing to the improvement of human welfare, progress and civilization, it is also an effective means of violating the law. Android devices are currently the most popular mobile devices(10).

Open source development is a great opportunity for the emergence of various new applications to answer user needs. Therefore, as an effort to facilitate surveyors in conducting pharmacy information surveys, it is necessary to create an Information System Application for Pharmacy Survey Instruments with Digital Maps Applications. Build an android-based Pharmacy Survey Instrument application to Determine the Map Location of a Drugstore that can be used by surveyors in registering pharmacies in Pekalongan Regency.

METHODS

This type of research is research and development with four steps to design an application-based pharmacy survey application on android with the following steps: 1) The first stage, the analysis of the research will begin by looking for definitions, specifications, theories, datasheets, application notes, results -Results of related research in the repertoire of scientific knowledge to determine the specifications of the application. 2) The second stage, the results of the analysis stage will be used to determine the specifications of each sub-system that forms the overall application

prototype so that it can be used as data to design hardware and software used to build the application as a whole. 3) The third stage, the results of the proposed system prototype design will be realized or made at the development stage. 4) The fourth stage, the last stage of the proposed system development is the overall system testing stage using the test criteria and specifications of the system that has been obtained in the previous step(11).

System development using the waterfall method(12). The waterfall method is also called classical cycle or linear sequential. This model requires a sequential and systematic system in system development. This model consists of several stages, namely system engineering and modeling, system requirements analysis, design, program writing, testing and maintenance(13). The waterfall method is one of the prevalent processes used to manage software development projects. The software is passed down from one phase to the next. Each team involved with the previous stage hands over the software to the next team with no additional input or responsibility required. This method is considered to be one of the easiest to man- age due to the predictable and closed nature of the outcomes. The major fallacy with this process is the assumption that when a phase is done, the work of that phase has been completed forever. However, in reality, analysis rarely stops with design(13)

The system design stage is carried out after the system analysis stage. The system design uses notation to assist in providing an overview or explanation to the user about the system to be created, namely the database, Unified Modelling Language (UML) design, and information on everything from data input to data output. To obtain structured data, it is necessary to define the database that will be stored and which will be used. Includes data storage structures, data formats, and access points. UML design starts from the design of Use Case Diagrams, Class Diagrams, Sequence Diagrams, Activity Diagrams, and Deployment Diagrams. Interface design is needed to provide an attractive appearance so that it is easy to understand(14).

RESULT AND DISCUSSION

1. Overview of Pharmacy Survey Instrument Information System with Digital Maps Application

The pharmacy survey application is a Web-based program that can be operated with an ordinary Windows XP computer with at least 512 RAM and which can also be accessed with an Android Smartphone or Windows Phone on GSM, 3G and CDMA networks such as Smartfren which has reached Pekalongan Regency in the lower and

upper areas. With the Mobile support facility, the display on the Smartphone will be better because it will adjust to the condition of the cellphone screen being used(15). The features contained in the Pharmacy Survey Instruments application with the Digital Maps Application are as follows:

a. Surveyor

Figure 1

Login Menu

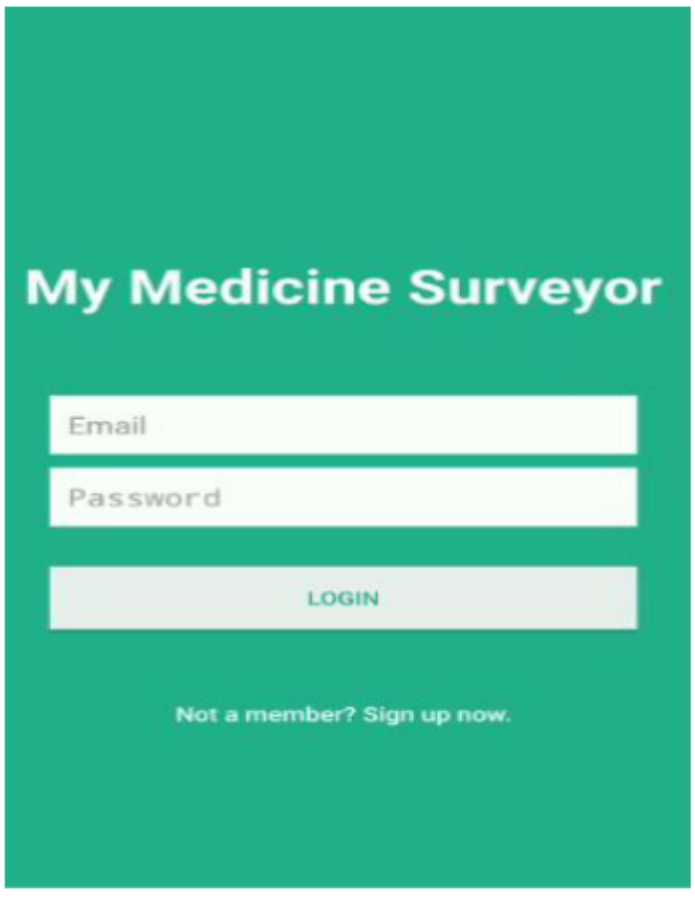

Figure 1 shows the login menu for surveyor. The login menu is used by surveyors to enter the Pharmacy Survey Instruments application by entering an email and password.

Figure 2

Home Menu

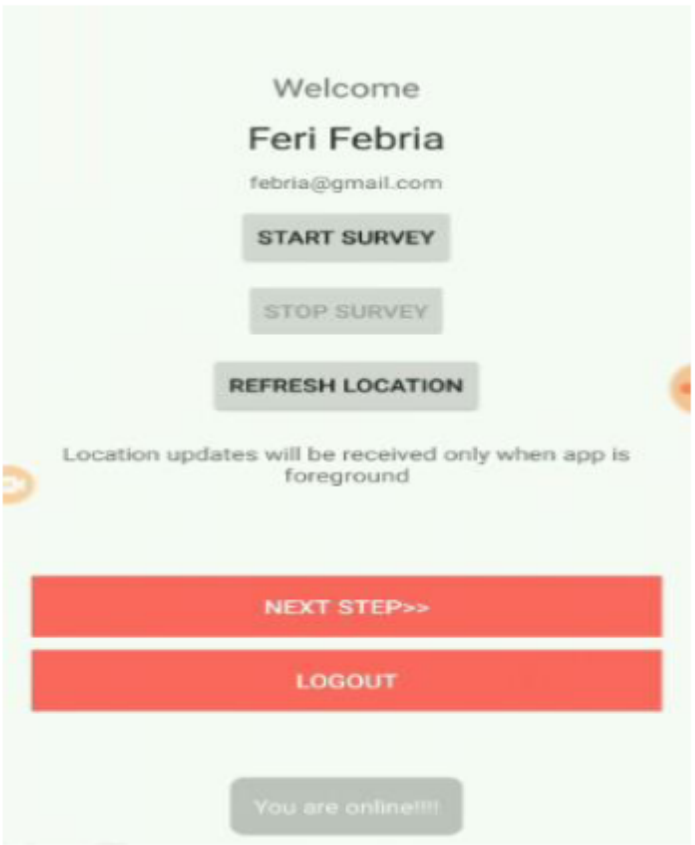

Figure 2 shows the Home menu for surveyor. The login menu is used by surveyors to enter the Pharmacy Survey Instruments application by entering an email and password. The home menu contains features to start a pharmacy survey and a feature to end a pharmacy survey. The home menu also contains a feature to refresh the pharmacy location so that the location is truly accurate. The use of the pharmacy survey application requires an internet connection because this application uses digital maps to record the location of the pharmacy. The home menu also contains a feature to go to the next menu and a logout feature from the pharmacy survey application.

Figure 3

Menu add pharmacy

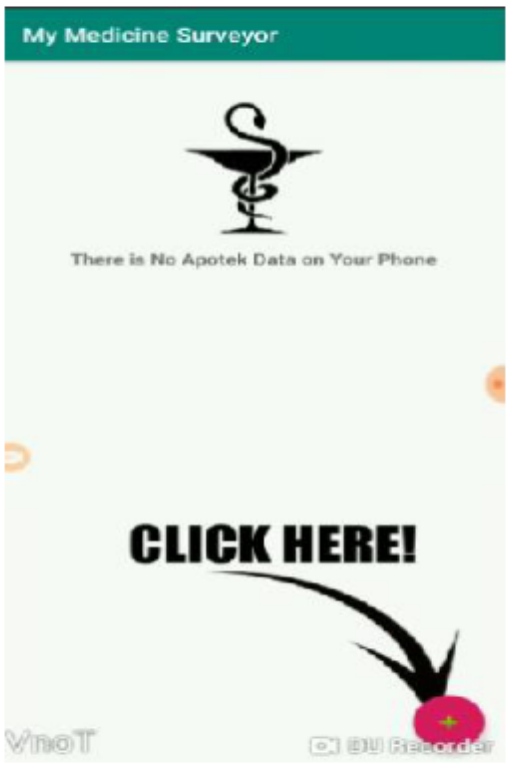

Figure 3 shows the menu add pharmacy for surveyor. The add pharmacy menu is used by surveyors to add a pharmacy. This menu is used by surveyors to add existing pharmacies anywhere according to the place being studied by pressing the plus symbol. In this study, surveyors added pharmacies in Pekalongan District, Indonesia.

Figure 4

Menu Form Pharmacy

Figure 4 shows the menu form pharmacy for surveyor. The pharmacy form menu is used by surveyors to fill in information about the name of the pharmacy, sub-district, village, complete address, cellphone number, and other information such as opening hours and closing hours of the pharmacy.

Figure 5

Sub-district Selection Menu

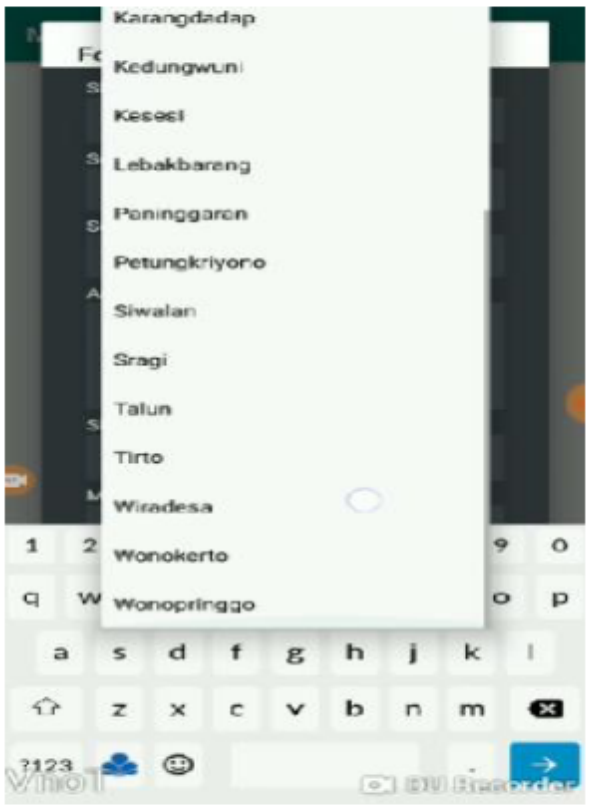

Figure 5 shows the sub-district selection menu for surveyor. The sub-district selection menu is used by surveyors to select the sub-district where the pharmacy is located. The sub-district selection menu provides information about all sub-districts in Pekalongan Regency which consists of 19 sub-districts. The sub-districts in Pekalongan District include Kandangserang, Paninggaran, Lebakbarang, Petungkriono, Talun, Doro, Karanganyar, Kajen, Kesesi, Sragi, Siwalan, Bojong, Wonopringgo, Kedungwuni, Karangdadap, Buaran, Tirto, Wiradesa, and Wonokerto.

Figure 6

Urban Village Selection Menu

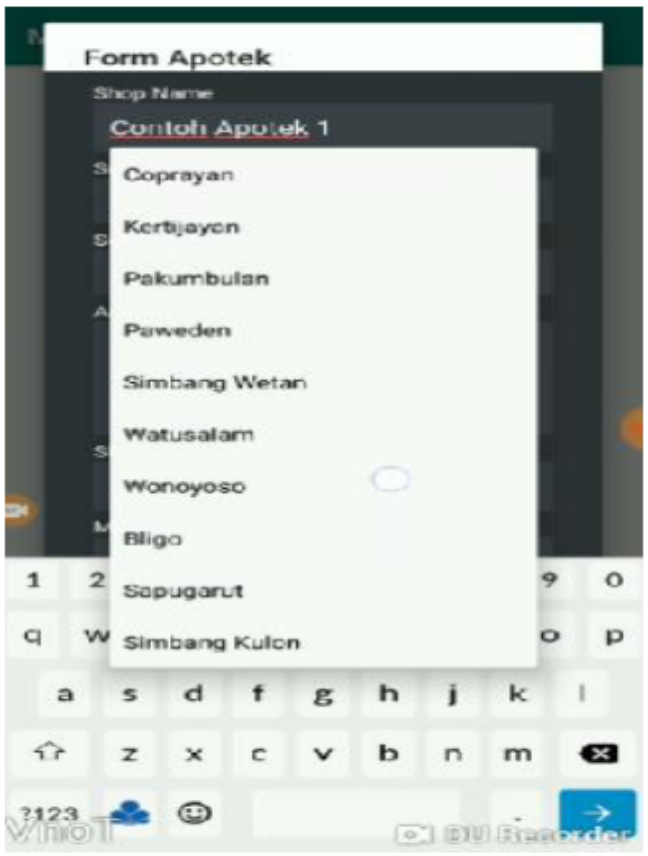

Figure 6 shows the urban village selection menu for surveyor. The urban village selection menu is used by surveyors to select the urban village where the pharmacy is located. The urban village selection menu provides information about villages in Pekalongan Regency.

Figure 7

Shooting and Video Recording Menu

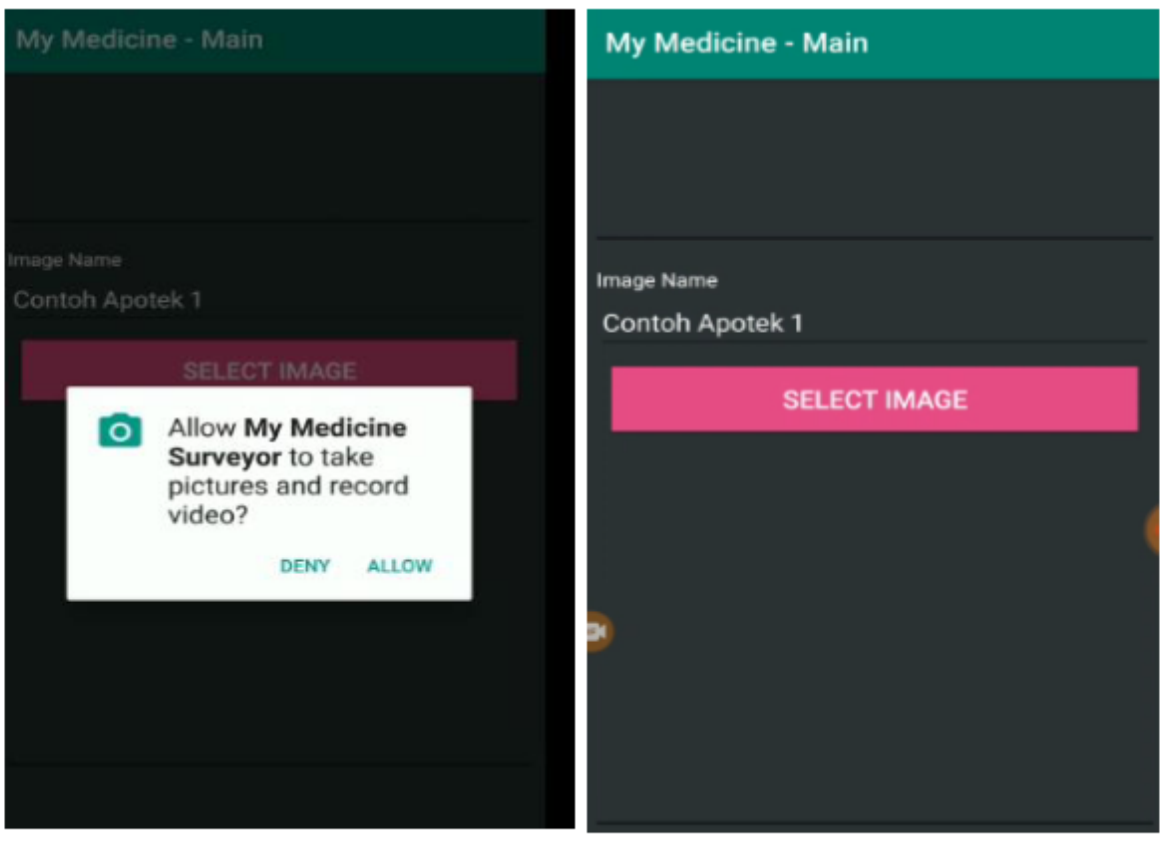

Figure 7 shows the shooting and video recording menu for surveyor. The shooting and Video Recording menu is used by surveyors to take pictures of the pharmacy, for example the front of the pharmacy, which is then used for the pharmacy display image. The video recording menu is used to record videos of the area around the pharmacy and the interior of the pharmacy.

Figure 8

Recording Location with Global Positioning System (GPS) Menu

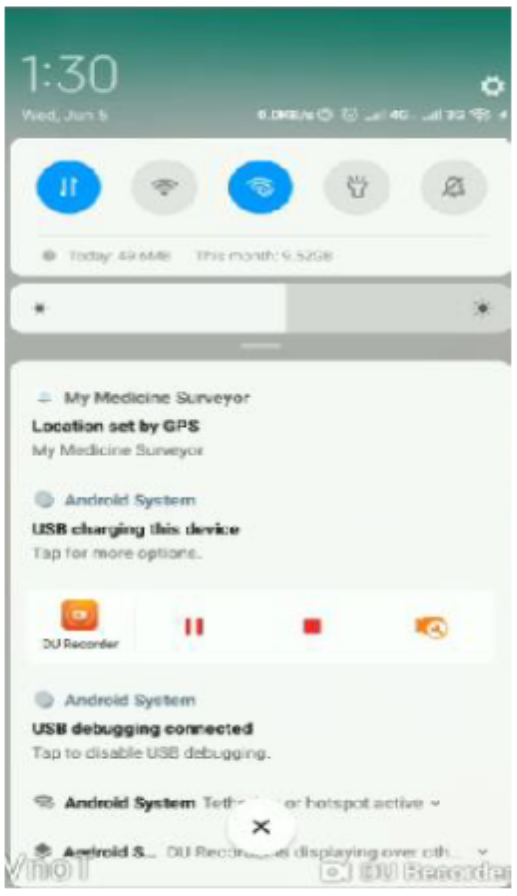

Figure 8 shows the recording location with Global Positioning System (GPS) Menu for surveyor. The Global Positioning System (GPS) is used by surveyors to record the location points where the pharmacy is located, such as details about the pharmacy address.

The Global Positioning System (GPS) uses a constellation of 24 satellites orbiting the earth. GPS finds the user position by calculating differences in the times the signals, from different satellites, take to reach the receiver. GPS signals are decoded, so the smart phone must have in-built GPS receiver. Assisted-GPS (A-GPS) is the new technology for smart phones that integrates the mobile network with the GPS to give a better accuracy of 5 to 10 meters. This fixes the position within seconds, has better coverage and can, in some cases, be used inside the buildings, consumes less battery power and requires fewer satellites(16).

Mostly suited for mobile devices, A-GPS takes assistance from GPRS and at times, the service provider network information, to pin-point the current location accurately. Moreover the amount of CPU and programming required for a GPS phone is reduced by diverting most of the work to the assistance server instead. A typical A-GPS enabled cell phone uses GPRS or other such Internet based data connection to build a contact with the assistance server for A-GPS. As this technique does not take into account the cell phone service provider network completely, we only pay for the GPRS usage charges and nothing else. The only down-side to this technology is that an A-GPS server cannot utilize any of the three standby satellites available for GPS connections.

AGPS minimizes the amount of memory and hardware that must be integrated into mobile devices in order to provide GPS-quality device locating ability as required by mobile devices. This keeps the mobile device simple and allows longer battery time. GPS is real-time solution provider whereas AGPS is not. The network usage is required every time we move out of the service area. It is useful only for locating a particular place in small area. There is no privacy in GPS and A-GPS since the Assistance server knows the location of the device. There needs to be communication over the wireless for processing of GPS information so this could be expensive.

Every point on the earth's surface can be expressed in two coordinates, namely longitude and latitude. All points having zero longitude lie on the Greenwich meridian (the great semicircle connecting the north and south poles and passing through Greenwich). Meanwhile, all points that have zero latitude lie on the equator (equator). East longitude is east of Greenwich, while west longitude is west of Greenwich. According to general agreement, east longitude is positive, while west longitude is negative. Meanwhile, all points located north of the equator are called north latitude, as well as points south of the equator are called south latitudes. North latitude is positive, while south latitude is negative.

Figure 9

Exit Menu

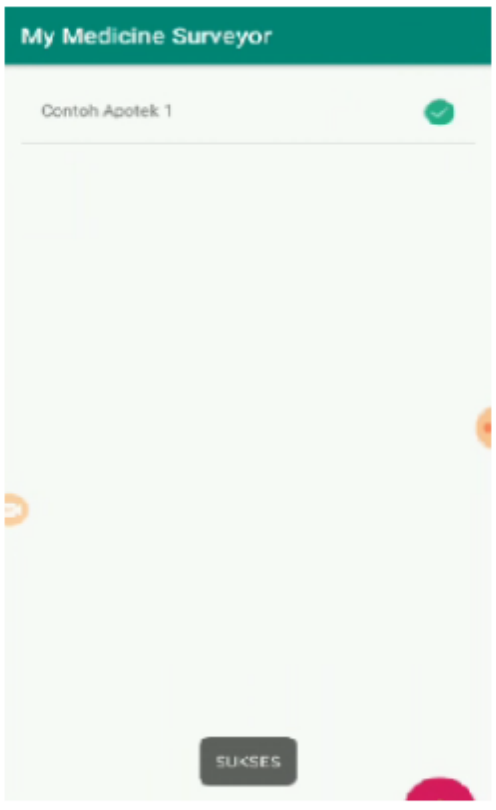

Figure 9 shows the exit Menu for surveyor. The exit menu is used by surveyors when they want to exit the pharmacy survey application.

These are the different classes present under Location API package to retrieve the Location information of the pharmacy. 1) Location Manager, the class provides access to the location service. It also provides facility to get the best Location Provider as per the criteria. 2) Location Provider, it's an abstract super class for location providers. A location provider provides periodic reports on the geographical location of the device. 3) Location Listener, this class provides callback methods which are called when location gets changed. The listener object has to be registered with the location manager. 4) Criteria, the class provides the application to choose suitable Location Provider by providing access to set of required properties of the Location Provider.

2. System Testing

To ensure that functional and non-functional requirements are met in the implementation of the Pharmacy Survey Instruments information system with the Digital Maps Application, several stages of system testing are carried out, including whether the interface runs as expected by using black box testing by the Admin.

Table 1

Login Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the login menu	Displays username and password fields	Show username and password fields	Fulfilled
2	The user selects the login menu by inputting according to the username and password provided	Displays the administrator/operator page with its menu	Show administrator/operator page with menu	Fulfilled
3	The user selects the login menu by entering the correct username and password	Displays the administrator/operator page with its menu	Show administrator/operator page with menu	Fulfilled
4	The user selects the login menu by entering the wrong	Displaying a warning message	Show warning message	Fulfilled

	username and password			

Table 2

Home Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the start survey menu	Displays a survey page extending downwards according to the position of the phone screen (mobile support)	The survey page appears widened according to the position of the cellphone screen (mobile support)	Fulfilled
2	The user presses the stop survey menu	Displays a survey page extending downwards according to the position of the phone screen (mobile support)	The survey page appears widened according to the position of the cellphone screen (mobile support)	Fulfilled
3	User presses the refresh location menu	Displaying the refresh location menu is already running well	The refresh location menu appears already running well	Fulfilled
4	The user presses the next step menu	Showing the next step menu is already running well	The next step menu appears already running well	Fulfilled

No	Test case	Expected results	Test result	Interpretation
5	The user presses the logout menu	Showing the logout menu has gone well	The logout menu appears already running well	Fulfilled

Table 3

Adding Pharmacy Menu Black Box

No	Test case	Expected results	Test result	Interpretation
1	The user presses the + button	Showing the + button is running well	Show button + is running well	Fulfilled

Table 4

Form Pharmacy Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the pharmacy form menu	Displays the pharmacy form menu extending downwards according to the position of the cellphone screen (mobile support) and running well	The pharmacy form menu appears widen according to the position of the cellphone screen (mobile support) and runs well	Fulfilled

Table 5

Sub-district Selection Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the menu select the sub-district	Displaying the select sub-district menu and it's running well	The select sub-district menu appears and it's running well	Fulfilled

Table 6

Urban Village Selection Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the menu select the urban village	Displaying the menu select the urban village has been going well	The menu for selecting the village has been running well	Fulfilled

Table 7

Shooting and Video Recording Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the shooting and records a video menu	Showing the shooting and recording video menu is going well	The menu for shooting and recording videos has been going well	Fulfilled

Table 8

Recording Location with Global Positioning System (GPS) Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	User presses menu to record location with GPS	Displaying the menu recording the location with GPS is already running well	The menu appears, recording location with GPS is running well	Fulfilled

Table 9

Exit Menu Black Box Test

No	Test case	Expected results	Test result	Interpretation
1	The user presses the exit menu	Showing the exit menu has been going well	The exit menu appears already running well	Fulfilled

Android-Based Pharmacy Survey Tool application as a whole can work well. Pharmacy Survey Instrument Mobile Application to Determine Pharmacy Location Map using GPS. GPS Tracker or often referred to as GPS Tracking is AVL (Automated Vehicle Locater) technology that allows users to track the position of vehicles, fleets or cars in Real-Time. GPS Tracking utilizes a combination of GSM and GPS technologies to determine the coordinates of an object, then translate it into a digital map(17).

CONCLUSION AND SUGGESTION

Android-Based Pharmacy Survey Instrument Application to Determine Pharmacy Location Maps that can be used by Surveyors in registering Pharmacies in Pekalongan Regency. The Pharmacy Survey Instrument application can make it easier for surveyors to record the location of the pharmacy with just one click on the cellphone. The pharmacy location points that have been recorded in the application can then be used by researchers to develop applications that provide the locations of pharmacies in

Pekalongan Regency, that can be used by people in Pekalongan Regency to know the location of the pharmacy and the route to the pharmacy to buy drugs officially.

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