Developing Android Based Ambulance Emergency Application in Sleman Region

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Abstract

The population of Sleman Regency is 1,318,086 and the death rate is very high. This study searches for people who have difficulty finding ambulance assistance. That's why an application was created to help sick people arrive on the scene. This app is equipped with LBS (Location-Based Services). This app also uses Firebase as data, a form of Google providing various data services to develop mobile apps like this one in real-time. This app is created in the Java programming language running in Android Studio. Furthermore, this application connects journalists and medical staff directly without the need for intermediaries or other people. In addition to knowing where the ambulance is when it arrives, the app is designed to overcome the problem of doctors determining routes and searching for hard-to-reach victims in an emergency provided with a mobile phone. This application was created to get an ambulance more comfortably and efficiently. The driver will know the exact location of the incident without having to search the incident. He will also get a lot of information. In addition, this application further accelerates quick evacuation of the injured or sick for quick medical assistance. So, this application is practical to use in critical situations. Current technological developments also include many innovations, so this research aims to help people use today's developing technology more efficiently.

Keywords: Ambulance, Mobile Application, LBS, Community.

I. INTRODUCTION

The rapid development of technology in Sleman has encouraged innovations in various application fields. One is the emergency ambulance calling application, which aims to provide precise coordinates and the fastest route to evacuate victims. Therefore, speedy and accurate medical assistance is needed so that people who need medical aid are resolved more quickly and do not increase the duration of evacuation so that the illnesses and injuries experienced by victims do not get worse. An emergency is an event, condition or situation that is abnormal and occurs suddenly so that it can impact the surrounding environment. The impacts during this emergency can disrupt activities in the surrounding environment [1]. Patients often need fast and responsive help[2].

In the ever-growing digital era, information and communication technology has played an essential role in changing the landscape of various sectors, including health services. One of the latest innovations attracting attention is the ambulance calling application, a modern solution that responds to the urgent need to provide emergency health services. This app bridges the gap between the critical time of an emergency and the rapid response needed to save lives. This application does more than calling an ambulance. It also utilizes technology to provide more detailed health information to the medical team. Users can include important information such as medical history, certain health conditions, and allergies, giving ambulance personnel a complete picture before arriving at the scene. This way, the ambulance calling app saves time and ensures that the care provided suits each patient's needs.

The main advantage of ambulance calling applications is their easier accessibility for the general public. Using smart devices such as smartphones, users can contact ambulance services with just a few taps of their fingers, shortening the time it takes to call for help. This is in line with the development of modern lifestyles, where speed and affordability of information are highly valued. In addition, this application utilizes advanced technology to improve the information provided to the medical team. Users can include essential details, such as medical history, specific health conditions, or allergies, which can prepare ambulance personnel better before arriving on the scene. This innovation opens the door to significant improvements in delivering appropriate and effective care.

This ambulance call application can be handled more efficiently by finding the fastest route and exact coordinates of the victim so that it does not cause new problems such as delays in the arrival of emergency calls and issues with delays that can occur. In this research, what is different from previous research is that the use of the LBS map appearance, which is displayed directly to the reporting user who will contact the ambulance driver and send the location of the ambulance, is still in the form of a screenshot or detailed image of the location of the reporting user which is sent to the ambulance driver. The other studies still use regular telephone numbers or even chat to send messages to ambulance drivers. Medical emergency conditions require patients to be mobilized

quickly by ambulance, precisely and accurately. To save the patient, the ambulance acts as the patient's helper and hopes for 17survival until the patient reaches the hospital [3]; traffic accidents, fires and crime are social social problems. If something dangerous happens and the community cannot deal with it, it is advisable to report it. Emergency ambulance calls usually occur when an accident occurs, someone dies, or someone is in an emergency. Therefore, this application was created to more effectively overcome various problems, including increased accidents with ambulances in traffic jams. Using this application can give users the fastest route to avoid traffic jams. The development of land transportation has made it easier for people to move from one area to another, but on the other hand, as can be seen in almost all big cities, it has had an impact on the emergence of various traffic problems such as violations, traffic jams and accidents which from time to time are increasingly complex [4], [5].

The method used in this application is the Location Based Service (LBS) method. Location Based Services are systems capable of disseminating information that can be accessed using mobile devices connected to the internet and GPS [6]. From this application, ambulance users no longer search for victim coordinates in a large area. The application can provide the user's location, the location of the referral hospital and the location of the nearest referral hospital to the user based on the location-based service application. The user location is taken as the layout centre, and the name of the POI is converted into a text tag and then placed around the centre [7]. Thus, this research aims to dig deeper into how ambulance calling apps can continue to improve emergency health services, increase response times and save lives. By involving key stakeholders and analyzing user experiences, this research provides valuable insights into further development and performance improvement of ambulance calling applications [8].

II. METHOD

A. Theoretical Basis

Ambulance vehicles, or ambulances, are vehicles used to transport patients from one place to another. Ambulances can transport patients who are immobile, seriously ill, or require emergency medical assistance. This ambulance vehicle is usually managed by doctors, paramedics and other medical personnel. Typically, ambulances can be found in hospitals, emergency rooms, or other places where emergency care is needed. Ambulance vehicles are equipped with various medical devices to enable on-site treatment. Some ambulances also have ventilators, heart monitors, and other medical equipment. In some cases, the driver may also act as a paramedic.

Android is a series of open-source software for various types of mobile devices with a corresponding open-source design based on Linux pioneered by Google. There are several versions of Android whose features are increasing [7]. Android Studio is a Linux-based operating system designed for devices with touch screens, such as smartphones and tablet computers. Android was initially developed by Android, Inc., with financial support from Google, which it purchased in 2005. The operating system was officially released on November 5, 2007. Android offers a different environment for developers. Each application has an equivalent level. Android doesn't differentiate between core apps and third-party apps. The provided API gives access to the phone's hardware and data or the data system itself. Users can even remove the core application and replace it with a third party [8].

A database is software used to store data. A database system is software that allows users to store data to obtain and maintain information according to their needs. Databases can store information in the form of numbers and text. Apart from that, databases have the advantage that databases can be used to shorten working time by speeding up access to information systems. An optimal database can improve information system access and help train path management performance [9] [10]. Java is a high-level programming language that focuses on object-oriented programming. Furthermore, java programs consist of units called "Classes." Each Class consists of methods that perform a specific task and return results. Java developers often use the collection of classes available in the Java Application Programming Interface (API) to extend the functionality of their programs. These classes are organized into groups called "packages." With the help of Java API, developers can create complex applications and applets by providing various required features [11].

Firebase is a service from Google that makes it easier for application developers to develop applications. With Firebase, developers can focus on developing applications without having to spend a lot of effort. Two interesting features of Firebase are Firebase Remote Config and Firebase Real-time Database. Apart from that, there are supporting features for applications that require notifications, namely Firebase Notifications [12]. Meanwhile, REST (REpresentational State Transfer) is a communication method architecture often applied in developing web-based services. The REST architecture generally runs via HTTP (Hypertext Transfer Protocol) and involves reading web pages containing XML or JSON files. This file describes and includes the content that will be presented. After going through a specific definition process, consumers can access the application interface in question. Meanwhile, RESTful API is an implementation of API. API is an abbreviation of

Application 9 Programming Interface, which is a “connector” that allows an application to interact with other applications and share data [13][14]. Furthermore, LBS (Location Based Service) is an information service in the form of geographic information that can only be accessed using a cellular telephone using an internet network connection to map locations precisely, making it easier for users to find the requested location.

B. Systems Analysis

Functional:

1. Opening this application requires an internet connection.
2. Users and ambulances must register an account first.
3. Ambulance readiness input is carried out by the ambulance.
4. The respective account owners can change the username and password.

Non-Functional

1. The application system is straightforward to understand.
2. The System Application guarantees the security of user data.
3. The application can only run on the Android system.
4. This Android-based ambulance service application for emergencies will display the location of ambulance services in the Yogyakarta City area, especially the district. Sleman can send emergency messages to the nearest hospital from the location directly via an application on a smartphone, making it easier for users to get an ambulance. This application was built using Android Studio and uses DFD (Data Flow Diagram) for business design and uses location-based service methods. The results of research on the Android-based ambulance service application for emergencies are that users can access the application to send emergency messages to the nearest registered hospital, see a list of ambulances registered in the application, and find out where we are currently. While the webserver admin can delete and process customer orders via the website [14].

Table 1 Hardware and Software

Hardware	Device	Software
Lenovo Ideapad 5i	Xiaomi Poco X3 Pro	Android Studio
Processor: Intel Core i5-1135G7 (4C / 8T, 2.4 / 4.2GHz, 8MB)	MIUI 12	VsCode
Ram 8 GB	Qualcomm Snapdragon 860	Firebase
Integrated Intel Iris Xe Graphics dan Nvidia GeForce mx450	6+128GB	

At this stage, we provide a list of the software and hardware used to create the application. Hardware is an element of a computer system, a tool that humans can see and read directly and supports the computerization process. Meanwhile, this software controls all existing hardware and is a collection of several commands that are executed by computer machines in carrying out their work [15].

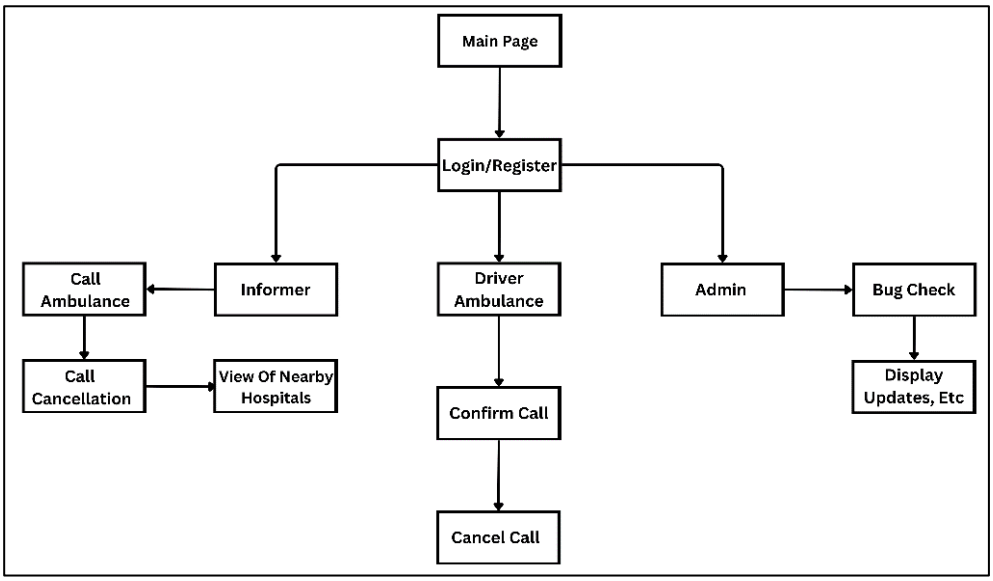


Figure 1 Architectural Models

This diagram explains that the Login and Account Registration page for ambulance reporting will appear when the main application page is opened. So, reporting users can use the ambulance call feature and view the ambulance agency's data profile. If the reporter wants to cancel the ambulance call, they can, and also, if the reporter wants to know what ambulances are available in the application. The ambulance driver can only confirm and cancel the reporter's call for users—admin users to maintain bugs and update features and data on the Myambulan application.

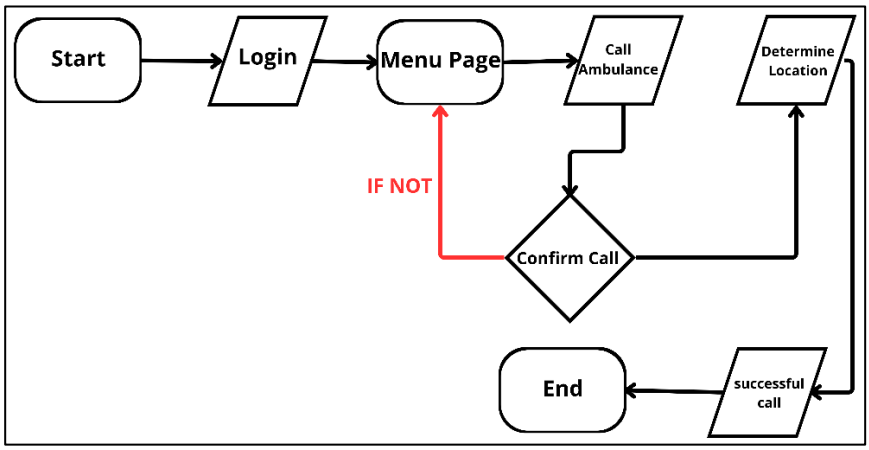


Figure 2 System Analysis Flowchart

From this diagram, we start and go to log in, then the system will process to the next page, namely the menu page, and if the reporting user makes an ambulance call, the system will process it to the user's driver to provide a confirmation notification. If not, the system will process the Return to Page menu, and if yes, the system will determine the user's location, and the call is successful and complete. The flowchart is a representation in the form of symbols and functions to describe the relationship between processes in detail when creating a program to be compiled [16].

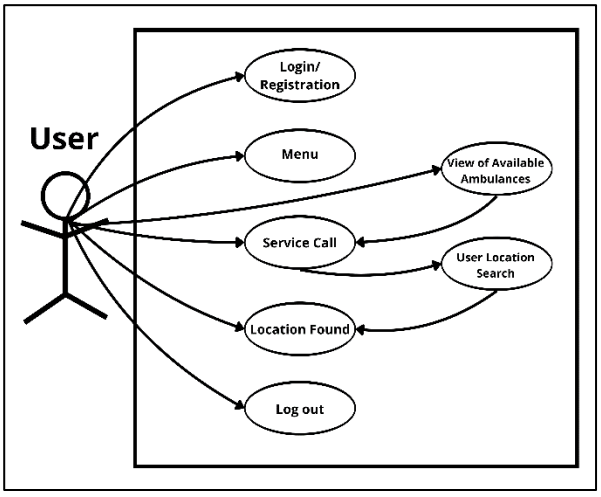


Figure 1 User/Reporter Use Case Diagram

This diagram explains that reporting users can access Login, Registration, Menu, display of available ambulances and service calls, connect the user's location to the system and locations found by the system, and log out.

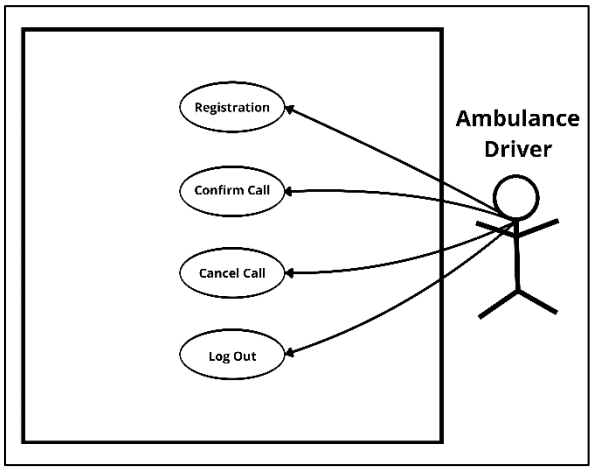


Figure 4 Driver Usecase Diagram

Ambulance driver users can log in, register, confirm calls, cancel calls and log out. A use case diagram is a diagram that describes the relationship between actors and the system. Use case diagrams can describe an interaction between one or more actors and the system to be created. Use case diagrams can also be used to find out what functions are contained in a system and display the interaction of an actor with the system. This component then explains the communication between actors and the existing system. Thus, use cases can be presented in a simple sequence and will be easily understood by consumers [17].

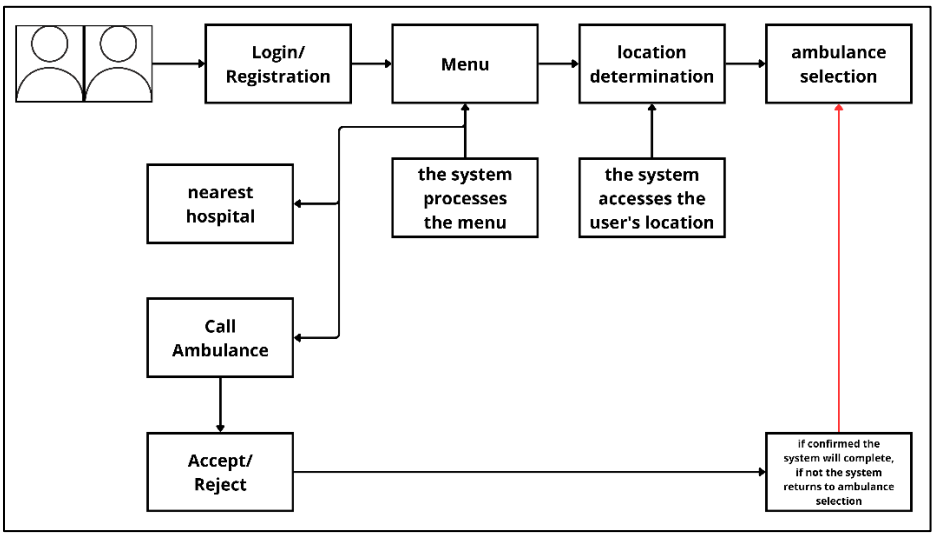


Figure 5 Activity Diagram

This diagram explains that the system will process login confirmation when a user logs in. After logging in, the user will enter the menu display, and the system will process menu activities. The menu has two features: calling an ambulance and the nearest hospital. When the user selects an ambulance call, the system will access the user's location and switch to ambulance selection. If the ambulance driver confirms, the system is complete, but the user will return to ambulance selection if the ambulance call is rejected. The Activity Diagram will be used to develop the activities of each case into a flow of activities from a module in the system [17].

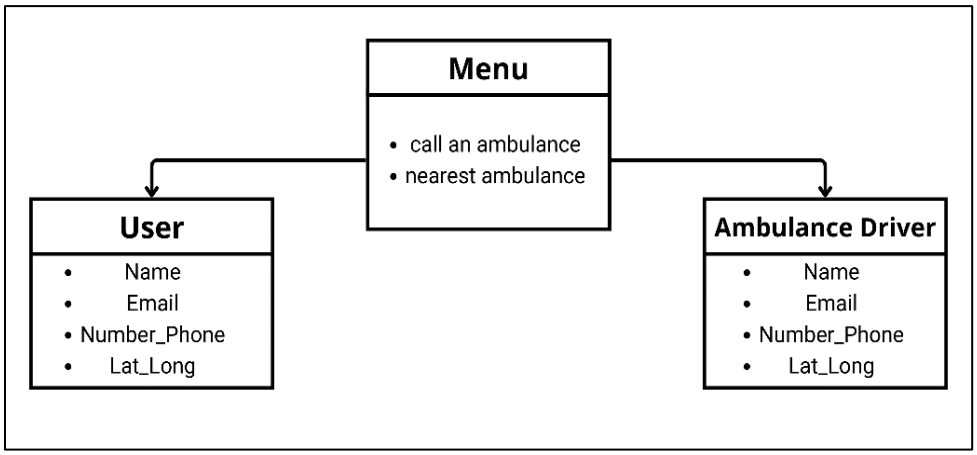


Figure 6 Class Diagrams

Menu displays user profiles and ambulance calls and for reporting users and drivers by entering name, email, telephone number and location data. Class Diagrams are diagrams that are often found in UML-based modelling. Class diagrams are used to show interactions between classes in the system [18]

III. RESULT AND DISCUSSION

This application uses Firebase authentication, and the data entered is in the form of email and password. If someone wants to register or add users to Firebase data, he/she can do it directly from the My Ambulance application. When someone registers, the system will immediately connect the data to Firebase in real time for that type of data by default from Firebase authentication.

Identifier	Providers	Created ↓	Signed In	User UID
ibrahim12@gmail.com	✉	Jan 14, 2024	Jan 14, 2024	unKiqN3FsifekQUvhb6McKW...
kirinosuke02@gmail.c...	✉	Oct 31, 2023	Nov 2, 2023	zXFrxp1pt2MkFWpIZjVChf8E...
ibrahim154@gmail.com	✉	Oct 28, 2023	Oct 30, 2023	J6gh1vxMqJT7EAf2fshWpHh...
cathval01@gmail.com	✉	Jun 14, 2023	Jun 14, 2023	RFcPMiz1HwZxbrK5rKXDNon...
fransiskacatty@gmail....	✉	Jun 14, 2023	Jun 14, 2023	6QZe8f25jNW7e6ufsTnuWt5...
ndullgaming12@gmail....	✉	Jun 12, 2023	Jun 12, 2023	qLzEbRjfTcScrqDM5vyiun5iUz...

Figure 7 Authentication

A. Application Results

At this stage the author explains the results of the application that has been created and discusses the application. This application covers several steps, they are registration, login, menu, user location, ambulance selection, ambulance detail, and call ambulance.

1. Registration

If you don't have a registered account, you can register by entering the email and password that you have never registered in the Myambulans application. The registration screen is a screen that functions to register a Myambulan account. Registration is an input of the user's data so that the user has data in the application system to be recognized by the application system.

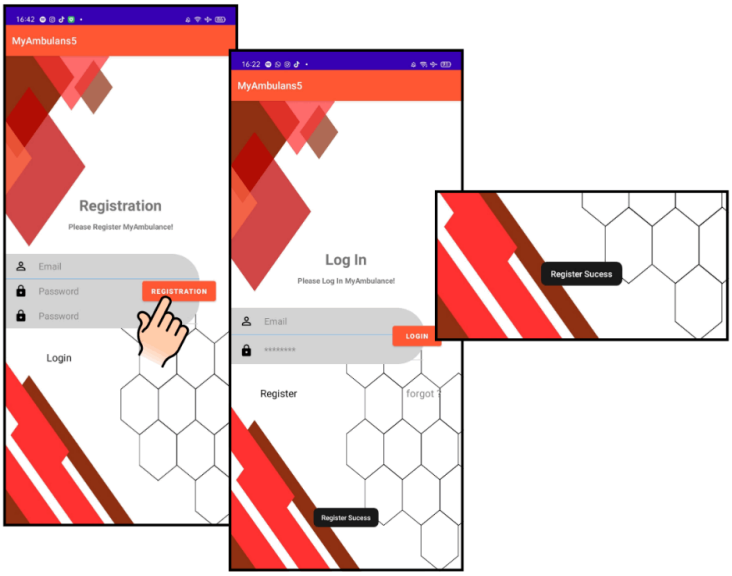


Figure 2 Registration

2. Login

The user can log in on this login screen by entering the email and password registered in the Myambulans application. If the email and password are wrong, a notification will appear that the login failed due to an email or password error. The system will recognize the user by logging the data in which the user is identified in the application.

Figure 3 Login

3. Menu

The features of the ambulance application are provided in the menu section. The screen displays two options: calling an ambulance and seeing the nearest location for an ambulance. The menu holds two systems: calling an ambulance and providing emergency hospital services using the Google API to get the user's location.

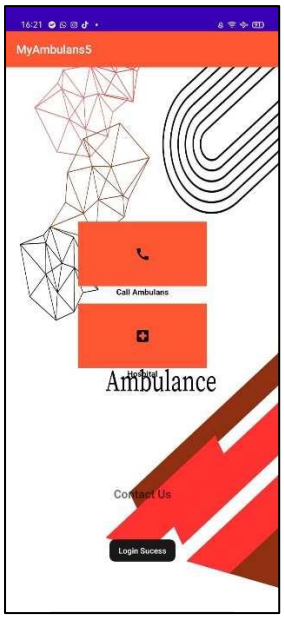


Figure 4 Menu

4. User Location

This section sends the location to the ambulance driver, which will appear on the user location screen. When selecting the call an ambulance menu to check the user's whereabouts, the user location has a system that sees the system location in real-time using the Google API. The user location will show the user's Latitude and Longitude and the user's current address.

Figure 5 User Location

5. Ambulance Selection

This section is part of selecting the ambulance agent that will be used by the user concerned. On the ambulance selection screen, the aim is to choose an ambulance agency. This ambulance selection acts as a system that provides services regarding ambulance agencies in this application.

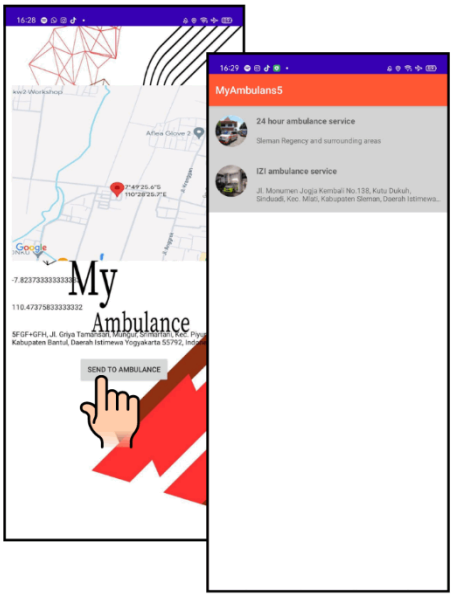


Figure 6 Ambulance Selection

6. Ambulance Details

This section has an overview of registered agencies from the address logo and agency name, and there is a call ambulance button to contact the ambulance. On the ambulance details screen, the screen shows the details and call button for the ambulance.

Figure 7 Ambulance Details

7. Call Ambulance

This section is the result of the completion of sending a message to the ambulance driver. If the user calls, it will go directly to the WhatsApp application to send a picture of the location and report it to the ambulance driver. This application has a system where if the user calls an ambulance, it will go directly to WhatsApp to select a photo, and it will automatically write, “There is an accident at this location; please come here now.”

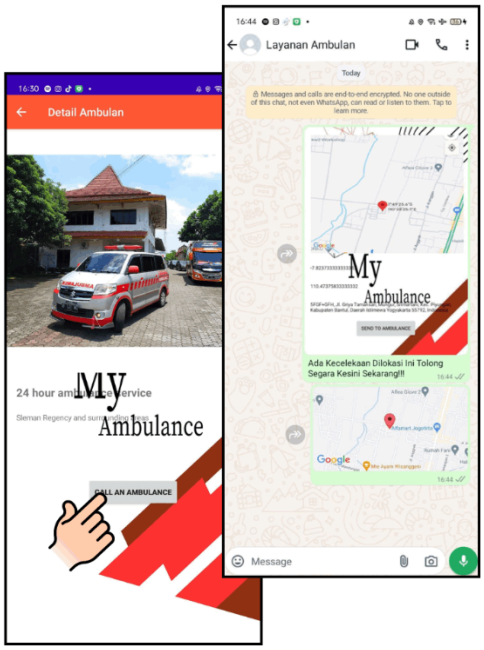
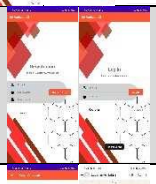


Figure 8 Call Ambulance

B. Implementation/Testing

After the application has been successfully created with Android Studio, the testing and evaluation stage continues to ensure that all the features in the application run well and no bugs are found. Application testing uses black-box testing techniques, referring to research by Al-Hakim et al. [19] [20]

Table 1 Testing Application

Testing	Input	Expected Output	Output
Reporting User Login	Email, Password	The user logs in by entering email and password.	
Reporting User Registration	Email, Password, Confirm Password	When a user registers using email and password.	
Emergency Location	User Send Location	The application will request access to the user's location.	
Reporting User Logout	User Logout	when the user logs out	

At this stage, the Android application has been tested on users to check whether the output or results provided are following those previously determined. The tests carried out included the capabilities of the login system, registration, sending emergency locations, and the nearest ambulance page.

Table 2 Test the Application on the Device

Function Device	Login	Call Ambulance	Logout
Android 7	✓	✓	✓
Android 8	✓	✓	✓
Android 9	✓	✓	✓
Android 11	✓	✓	✓

At this stage, the Android application will be functionally tested using smartphone testing and the Android emulator testing studio to ensure its features function normally.

C. Discussion

First, this application's main advantage is its ability to provide quick and easy access to call an ambulance. Users need to open the app, identify their location, and submit a request for help with a single tap. This can be very useful in emergencies where time is precious, and every second can make the difference between life and death. Ease of Access: One of the main advantages of ambulance calling apps is their ease of access. Users can download this app on their smartphones using one touch and contact emergency services or dispatch centres to request ambulance assistance. These applications can provide faster and easier access compared to traditional methods involving telephone calls.

Localization and Tracking: Ambulance calling applications often have accurate location tracking features. When someone requests help through the app, their location is sent to the emergency services centre, so medical personnel can quickly locate the user. This tracking feature is handy in emergencies when someone cannot clearly state their address or location. Fast Emergency Call: In medical emergency situations, every second counts. The ambulance call app allows users to contact emergency services quickly and directly, speeding up medical personnel's timely response. This application can also help reduce the load on the telephone emergency call system so that the service can handle other emergency calls more efficiently.

Notifications to Nearby People: Some ambulance calling applications also offer an automatic notification feature to the user's closest people when a request for medical assistance is sent. It can notify the user's family or close friends about an ongoing emergency and enable them to provide additional support and help if needed. Ambulance calling applications are innovative solutions that can increase efficiency and responsibility in handling medical emergencies. With these applications, people can quickly and easily access needed medical assistance. This discussion will discuss some advantages and challenges of using an ambulance calling application.

However, several challenges need to be overcome in implementing this ambulance calling application. One of them is the security and privacy aspect of user data. Developers need to ensure that the security of users' personal data is guaranteed so that it is not misused by irresponsible parties. Another challenge is internet connectivity, which can be an obstacle in some remote areas or when network disruption occurs. Developers must think about backup solutions or ensure that applications function correctly in less stable network conditions. The ambulance call app is a positive step towards improving the medical emergency system. By continuing to develop and improve aspects such as security, privacy, and connectivity, this application has the potential to positively impact lifesaving and faster and more effective medical services.

From the research results designed and tested, Myambulans application users can log in and register via this application. The users can also call an ambulance using the LBS (Location Based Service) system; this system application can detect the user's location, and the user can also send the location to the ambulance driver, but in previous research, there was no significant difference. However, for the display problems, it is substantial. The researchers took two comparisons between the earlier study and this research. The first, in this research, the design of an Android application for calling an ambulance in Sidosari village uses the same method: LBS (Location Based Service). However, in this study, the admin uses admin to accept and reject ambulance calls, and this application displays the telephone number of the ambulance driver [21]. The second, the Android-based emergency ambulance service application in this study uses the same LBS (Location Service), but this study displays the location of the nearest agency and hospital and makes calls to this study using the direct method to the agency's cell phone [22] [23]. The last, the design of an information system for reporting emergencies in Mataram (a case study of emergency call number 112). This research connects the application to fire, traffic, and criminal medical. This application differs in terms of ordering emergency calls. If a certain incident occurs, the user will be sent a report so the application admin can forward the report to the agency driver.

Table 3 Experimental Data and Results

Experimental Data	Application Input	Results	Information
1	Register	Succeed	The data has successfully entered Firebase
2	Login	Succeed	Registered data and displays the menu
3	Location	Succeed	Displays the user's location
4	Ambulance List	Succeed	Displays registered ambulance agencies
5	Nearest Hospital	Succeed	Displays a list of nearby hospitals on Google Maps
6	Call Ambulance	Succeed	Successfully provided the location image from the application to the driver
7	See nearby drivers and connect to the user's location	Fail	The application cannot connect directly to each user and driver location
8	Log out	Succeed	Log out of the account

In the results table for this application, you can use the application but cannot use the connected location of the ambulance reporting user and ambulance driver due to deficiencies in this application. Other features or systems have been successful in being used properly.

IV. CONCLUSION

The ambulance calling application is a crucial innovation in providing fast and efficient emergency health services. With this technology, people can easily and quickly ask for help when facing a medical emergency. The conclusion of this ambulance calling application highlights several essential aspects that can improve the health service system. First, this application speeds up response time in emergencies. With a few clicks on the mobile phone, one can directly contact the ambulance control centre and provide the necessary information. This reduces the time required to obtain appropriate medical assistance, increasing the chances of rescue and successful treatment. Second, the application allows users to provide more detailed and accurate information about the patient's health condition. The medical team can be better prepared before arriving at the scene by including information such as medical history, allergies, or special health conditions. This provides an opportunity to provide more effective care tailored to the patient's specific needs.

In addition, the ambulance calling application also creates a tracking system that maintains the movement of ambulances in real-time. This helps optimize travel routes and ensures ambulances arrive at the scene as quickly as possible. With this tracking, the control centre can provide up-to-date information to parties who need it, such as hospitals or patient families. Therefore, the ambulance calling application provides a practical solution in emergency medical assistance and presents a significant innovation in increasing efficiency and the quality of health services in the community. This conclusion confirms that the use of technology in the health sector brings substantial benefits in saving lives and improving the welfare of society as a whole.

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