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JomRonda: Mobile Application for Security Guard Patrolling

Nur'Ain Syafiqah binti Bibit, *Zamlina binti Abdullah, Nurazian binti Mior Dahlan, Azlin binti Dahlan
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Cawangan Melaka, Kampus Jasin, Merlimau, Melaka, Malaysia
pika.syafiqah999@gmail.com, *zamlinaabdullah@uitm.edu.my, nurazian@uitm.edu.my, azlindah@uitm.edu.my
Corresponding Author: Zamlina binti Abdullah

Abstract: Security patrolling is the process of routinely walking or driving through an area to maintain safety and follow the rules. Few studies discovered issues in security, accuracy and dependability of using non-computerized devices such as watchman clock. One of the issues is hard to monitor the tasks where the watchman tends to avoid their duties by attempting to use the duplicity and adjustment to the watchman's clock and the key. Yet, the watchman forgets to make daily reports in a logbook at each checkpoint resulting in inaccuracy for authorities to attend and managing any serious emergency. Focussing on the issues, this application is designed with patrolling techniques called geofencing whereby the watchman's location is tracked and data about patrolling is recorded to a database once crosses a virtual boundary. Stakeholders get benefit from the application by keeping track of and reading daily reports digitally. Furthermore, it contains SOS features or international standards for signalling distress allowing users to alert one another in the event of an emergency in the area via a form and an in-app notification. This project follows a methodology known as the Modified Waterfall Model, which entails four stages: requirement gathering and analysis, design, implementation and testing. Future improvements are daily and monthly reporting to authorities can be generated and sent through email. Yet, the application needs temporary storage and the database will be updated as soon as the internet connection is restored.

Keywords : *Security patrolling, watchman, geofencing, mobile application, modified waterfall model*

1. Introduction

Security guards are responsible for protecting the building and those who are in the specified area, such as information, teachers, students, staff and visitors. Apart from that, they are also in charge of enforcing all relevant rules to maintain the safety of each assigned area or checkpoint, supervising everyone at the Control Post, ensuring that everyone is following the rules and assisting in the resolution of any requests for assistance from the public or local staff in the school. Furthermore, they must keep the key of the watchman clock safe and integrity. They cannot make copies of the keys or give them to other people. The security guard patrolling procedure at school is by using a watchman clock to record the patrolling time, and they are also given a logbook every month to record the daily patrolling report. The main equipment needed and used by the security guards for patrolling are a watchman clock, walkie-talkie, whistle, torchlight, and security wood baton. A watchman clock is a mechanical clock that consists of a key and a clock, and it is used in a way by inserting the key into the clock, rotating it and a time stamp would be pressed onto a strip of paper rolled inside the clock. There are four different watchman clock keys at each checkpoint which are keys 1, 2, 3, and 4 to show the recorded patrolling time from each checkpoint.

The use of a non-computerized device, the watchman clock, brings several impacts in terms of security, accuracy and reliability. Based on the interview conducted with stakeholders, Madam Sazaridal Asslidah mentioned that when using a watchman clock, the possibility of getting unreliable information is high since a watchman clock is physical equipment where the key can be duplicated and the time on the clock can be manually adjusted. She also mentioned that there was an incident where watchmen were caught cheating while performing their duty by adjusting the time on the watchman clock and not patrolling all the checkpoints around the designated area as they had duplicate keys to lock the time using the watchman clock.

Based on the survey conducted to security guards, 75% tend to forget the incident that occurred at each checkpoint when they are required to write a daily report in a logbook after completing each patrol session. As a result, the information in the logbook may be untrustworthy because the authorities cannot verify its veracity.

The stakeholder revealed that it is difficult for security guards and authorities to alert each other in the event of a serious emergency. Watchmen are only given walkie-talkies to use among coworkers during patrol sessions. Based on the issues mentioned above, there is a necessity to introduce a mobile application to be used by security guards and related parties. This paper aims to develop an application that applies geofencing, SOS and centralized database.

2. Literature Review

According to Chen, Cheng, & Wise (2017), patrolling is defined as the act of walking or traveling around the area, at regular intervals, to protect or supervise it. The act refers to protecting people from any harm, providing a save environment for people, being alert for any emergency and many more. The categories are persons, property and information mentioned by O'Rourke (2019).

A. Mobile Application

According to Phongtraychack & Dolgaya (2018), a mobile application is a software program that runs on mobile devices such as smartphones and tablets. With the outcome of current technological advancements and because of the confluence of media, information technology, the internet, and sophisticated technologies, mobile applications have emerged. The development of society can be aided by mobile applications in terms of time savings and increased productivity since there is less computer use, so less power consumption and improvement of IT infrastructure in developing countries.

B. Geofencing

A geofence, sometimes known as a virtual fence, is used to enclose a specific geographical area. When a mobile application detects that it has been moved to a geofenced area, the app sends a signal to the device's server. To specify a precise location by providing its latitude and longitude, a radius can be added if we wish to change the site's proximity. Geofencing can be defined using latitude, longitude, and radius by constructing a circular region, or fence, around the intended location of interest (Syamimi & Amir, 2018). According to Statler (2016) in his research, geofencing is divided into two categories which an Active geofence and Passive geofence. An active geofence is a condition where the geofence is only functioning when the application is turned on. This means the application is more suitable for those who have specific users. While the passive geofence can work in all conditions such as the application is open, closed and even terminated. It means that the geofence can work in the background, but it will not achieve the same level of precision as the active method. The passive method is a suitable geofence method for businesses to use as it can target anybody, especially for advertising or promoting business by sending push notifications about the business's products. Aside from that, geofencing is used in the background where the user does not need to open it always. However, geofencing is battery consuming. Thus, this will lead the users to turn off the feature (Syamimi & Amir, 2018).

C. SOS

It's common to hear SOS referred to as an abbreviation for "Save Our Souls" or "Save Our Ships," but these are just backronyms for the words themselves. The signal is not even meant to be three separate letters. It's just a string of three dots, three dashes, and three dots that run together in Morse code without any spaces or full stops (...—-...) (Soniak, 2022). Apart from that, SOS is an internationally recognized signal of distress in radio code. In our generation, SOS has been used to give a signal if any emergency occurs. An individual is subject to a variety of events, such as being involved in an accident, being the victim of a crime, or being hijacked. People are fortunate in that they always have their mobile phones close at hand, which allows them to have a greater sense of safety. They will be able to quickly respond to dangerous situations and protect their lives by acting in this manner (Chauhan et al., 2020). Many SOS applications are available for mobile applications because mobile phones are a necessity that everyone must have. Besides, there are also different technologies used to send SOS signals such as walkie-talkies, beacons, GPS and more. In this project, there will be a function where the security guards and school authorities can notify all the application users of an emergency occurring using the SOS function.

D. Waterfall Model

The Waterfall model came first in the family of Process Models. A linear sequential life cycle model is another name for this concept. There is little complexity to its operation. There is no overlap and iteration between

stages in a Waterfall model means each stage must be completed before moving on to the next and there is no correction that can be made after one phase is done. The Waterfall model is a linear sequential life cycle model because it depicts the software development process in this way. Therefore, starting a new phase of development requires finishing the one before it (Senarath, 2021). According to Aroral, business analysis, design, implementation, testing, and maintenance are Waterfall model phases. This strategy proved successful, and numerous development firms and industrial manufacturers use it. Many scholars praise the Waterfall model for its simplicity compared to other systems development life cycle models (2021).

E. Modified Waterfall Model

In Gao and Hembroff's (2012) studies, Modified Waterfall is their chosen approach, and they have stated that even after the maintenance phase, the product will not be finished because based on the user feedback collected, they will use it to make improvements on the project and the phases might be returned to the requirement phase. The Modified Waterfall model that the author used in their project. Thus, the Waterfall model can be modified in terms of including iteration on some phases according to which will be more beneficial or include other suitable material on the Classic Waterfall model.

3. Methodology

The application is guided by the modified waterfall methodology that involves 4 phases which are requirement gathering and analysis, design, development and testing.

A. Requirement Gathering and Analysis

Many journals and articles were reviewed to get information about this topic, obtained experience from stakeholders through interviews, conducted surveys to get feedback and opinions from related respondents, implemented of mobile application for efficient patrolling and retrieved some ideas from several existing applications. All the data gathered will be used to identify the problem and determine the objectives, scope and significance of developing this project.

B. Design

The design phase is where the developer needs to design a flowchart, storyboard and use case diagram before further development. Figure 1, figure 2 and Figure 3 show the storyboard of the interface. Figure 4 shows a use case diagram.

Figure 1: Storyboard design for admin home page, login page and admin dashboard

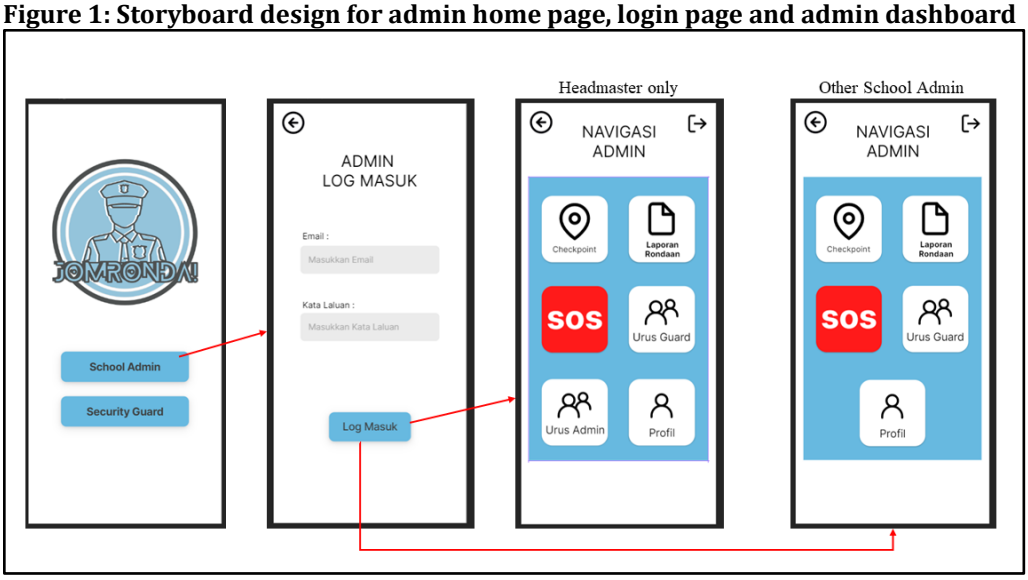


Figure 2: Storyboard design for super admin (headmaster) manage other users account

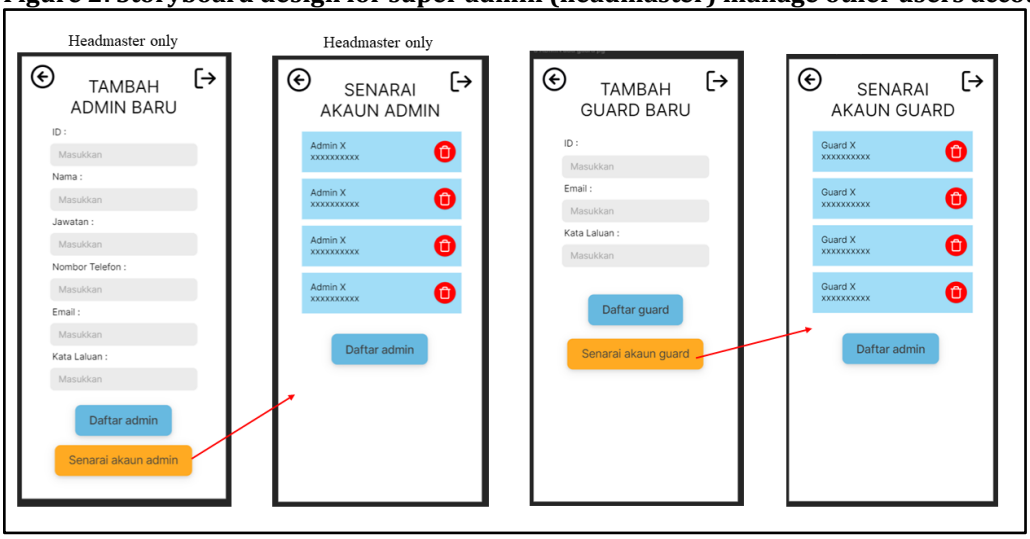


Figure 3: Storyboard design for school admin view checkpoint, add checkpoint and view patrolling report

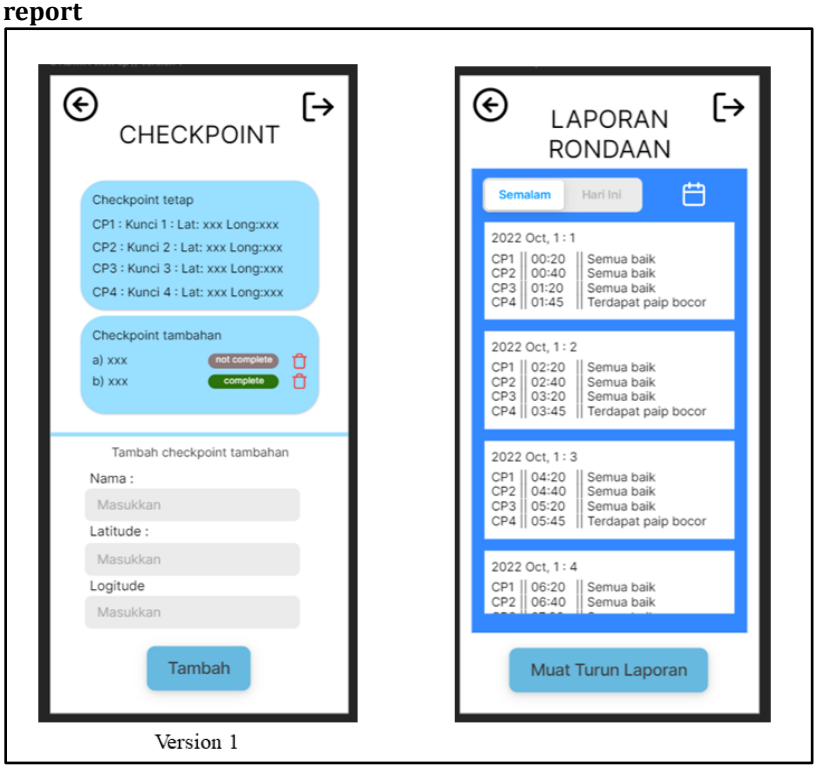
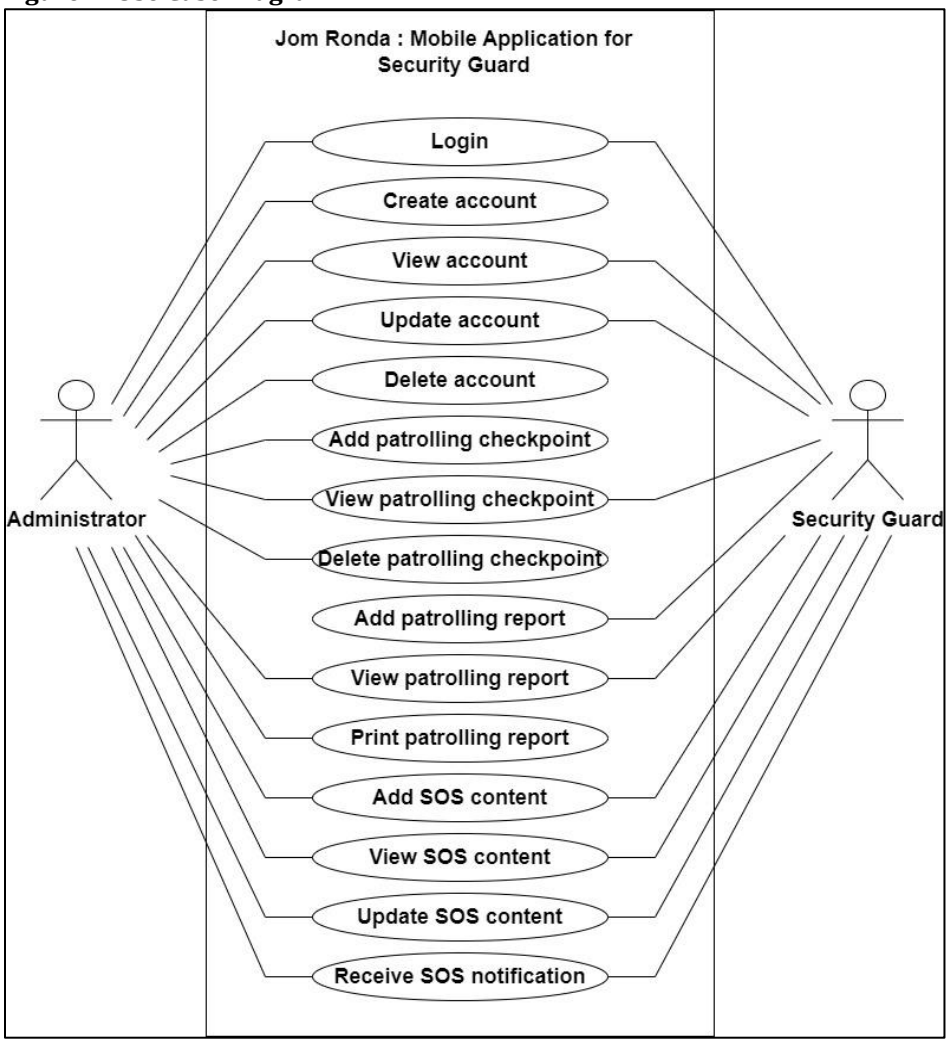


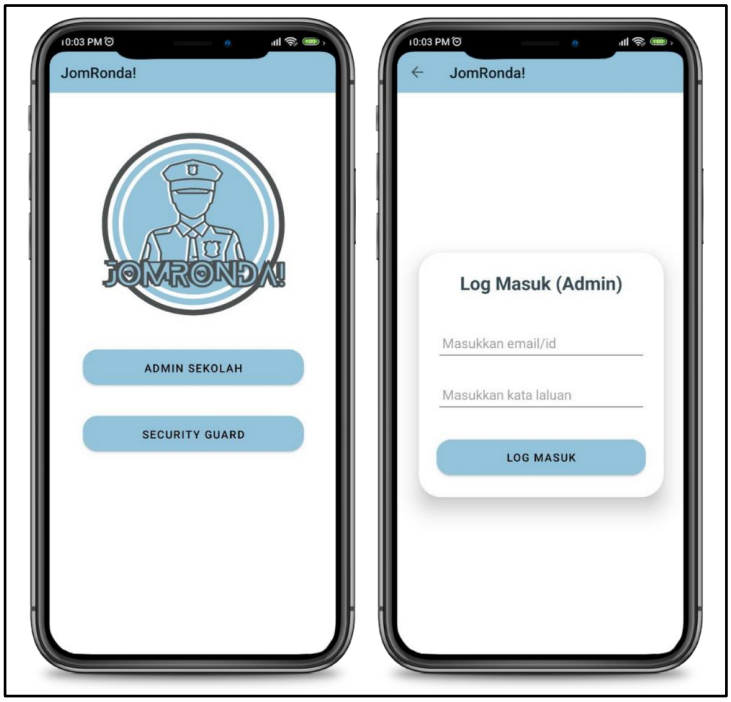
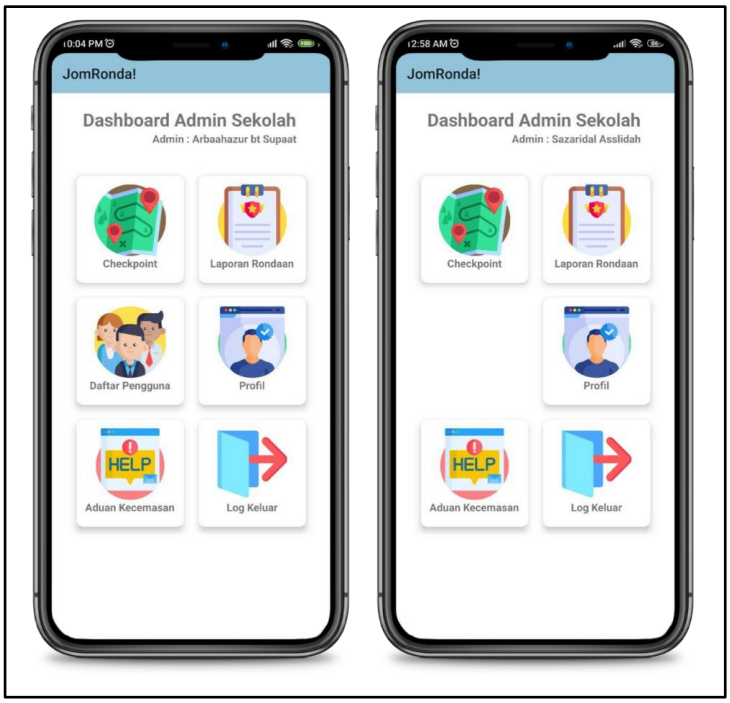
Figure 4: Use Case Diagram

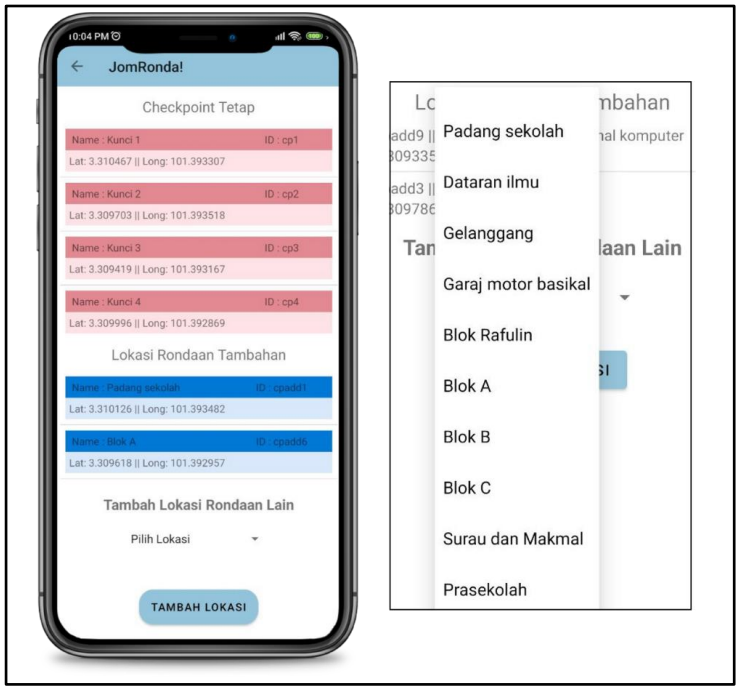
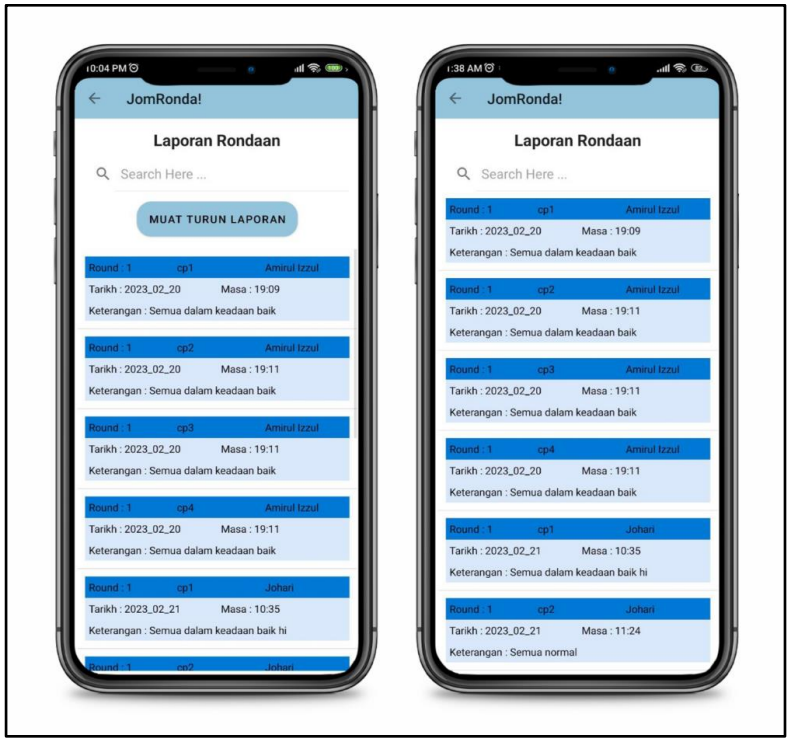


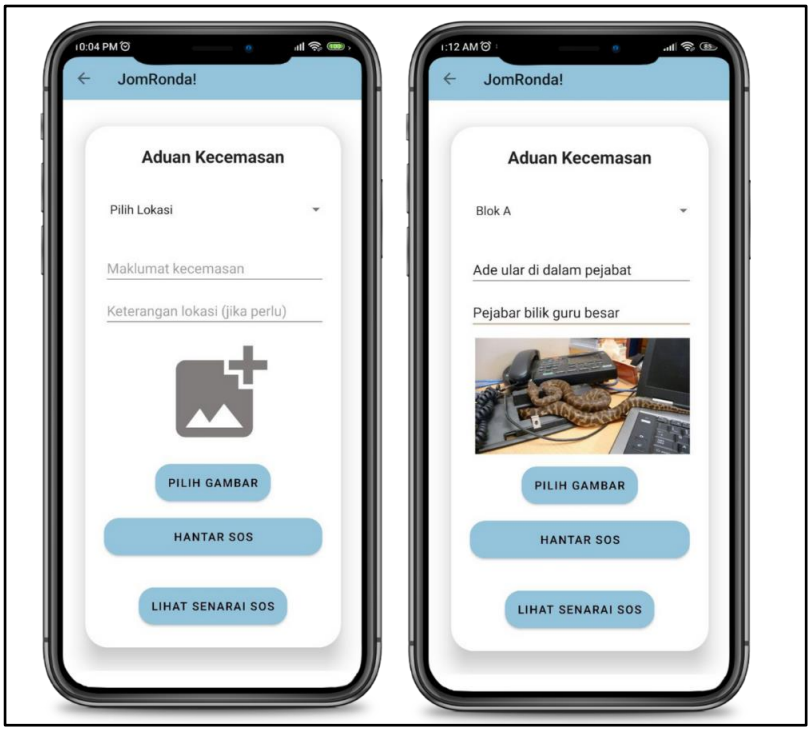
C. Implementation

The mobile application has been developed using Java language, Android Studio as the integrated development environment (IDE) and Firebase Realtime Database as the database. Android Studio uses the Extensible Markup Language (XML) which is a simple text-based format for representing structured information. Table 1 represents the main function of the application.

Table 1: List of Main Functions in JomRonda Application And Explanation

Function	Details	Interface
Login	The login function is used for the security guards and the school admin to redirect to their user interface respectively.	
Manage user account	This function allows the headmaster to manage security guards and other school admin accounts. The headmaster can create new accounts for newly hired school guards or for the school admin who she wants to assign to manage this JomRonda application and delete old accounts for those who have resigned from their positions.	

Patrolling the checkpoints	Security guards can patrol all of the checkpoints by using their mobile phones as the features is geofencing technique. The device will be triggered once entered the predetermined area, and an action, which is the date and time that the patrolling was performed, will automatically be stored in the database.	
Manage patrolling report	Security guards can fill up a form and report the current situation at each checkpoint. Once the form is submitted, the information will be automatically stored in the database, and the administration of the school will be able to access the report data at any time using the mobile application.	

Manage SOS	The SOS function is to notify any of the application users if there is an emergency. However, in major crises, such as fires or homicides in the school, they must first contact the fire department or the police. The function includes a form for entering details to send an emergency notification to security guards or school admin.	

D. Testing

Testing is conducted using functional testing that has been implemented by 3 users. The users are the developer, supervisor and examiner. All the main functions in the JomRonda application have been tested, worked well as expected and met the objectives. The testing refers to use case activities. It is proved that all the use cases function very well.

4. Results and Discussion

The functional testing is analyzed based on the activities in the Use Case Diagram. Table 2 is the summary of information from the testing.

Table 2 : User Testing

Activity	Function (Yes (Y) / No (N))		
	User 1	User 2	User 3
Login	Y	Y	Y
Create Account	Y	Y	Y
View Account	Y	Y	Y
Update Account	Y	Y	Y
Delete Account	Y	Y	Y
Add Patrolling Checkpoint	Y	Y	Y
View Patrolling Checkpoint	Y	Y	Y
Delete Patrolling Checkpoint	Y	Y	Y
Add Patrolling Report	Y	Y	Y

View Patrolling Report	Y	Y	Y
Print Patrolling Report	Y	Y	Y
Add SOS content	Y	Y	Y
View SOS content	Y	Y	Y
Update SOS content	Y	Y	Y
Receive SOS notification	Y	Y	Y

The testing was carried out to identify the errors encountered while exploring. The Jom Ronda application. It also assists the developer in obtaining any. Feedback on the application. The user interface and functionality of the application are reviewed by stakeholders and improvement has been done. They are satisfied and approve that the application is beneficial for them. Furthermore, the application's function is working very well. This indicates that the users. Appear to understand the application's purpose. The strength of this application is that it will provide security patrolling and other stakeholders to manage their work efficiently. This application provides a geofencing technique, SOS and centralized database features.

5. Conclusion

This application benefits security guard patrol by managing their profile, automatically detecting all the checkpoints, filling up and submitting the form and report easily at each checkpoint and sending emergency messages to authorities. The authorities can also rely on the application to monitor the security guard's work, receive the report, and alert with any emergency message received.

However, the project is developed for generating reports that can be viewed using mobile applications only. Sometimes the checkpoint area has intermittent internet connection that will affect the functionality of the application. As a future work, it is highly recommended that daily and monthly reports be generated and sent through email. Another enhancement is the application requires temporary storage and the database will be updated as soon as an internet connection is restored.

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