

Women Safety Application Using Geolocation

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To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v13-i9/18896> DOI:10.6007/IJARBSS/v13-i9/18896

Published Date: 08 October 2023

Abstract

Women's safety nowadays has become a concern not only for women but the society. The increase in crime rates against women in terms of mental and sexual abuse, rape, robbery, and domestic violence increases their fear of becoming victims to such crimes as they move through workplaces, homes, and streets at their own risk. The situation affected their freedom of mobility, reduces them to participate in activities involving society due to such fear. Negatively, this will impact on their health and well-being. Based on data reported by Malaysia Royal Police (RMP) in 2021, about 11,914 cases of sexual harassment involving women were recorded from 2018 to 2021. Thus, a huge measure must be taken to overcome this problem. This paper represents an android based mobile application named "Women Safety" that can help women facing such circumstances so that they will feel safe while traveling around. This application uses Geolocation method to get the latitude and longitude of the victim's current location. The Short-Message-Service (SMS) will be sent automatically to all selected victims' contact numbers. It also provides safety features such as SOS alarm to alert the public of any misbehavior, a list of helpline numbers that victims can directly contact for an emergency. The functionality test has been done to verify whether the app is working as intended. Results show that it can be used to facilitate the user without any problems.

Keywords: Mobile Application, Women Crime, Women Safety, Geolocation, SOS Alarm.

Introduction

Women's security has become a major issue especially in today's world as they were also like men, contribute to the economic growth. Violence against women considered an act of gender-based violence which tend to cause sexual, physical, and mental injury for women publicly or privately (United Nation, 1993). Many women hesitate to step out from their safe zone for fear of being sexually abuse and harassed by strangers. Some women rely on public transport to travel for work, class, or other public places, making it difficult for them to be mobile as this public transport areas reported to be a high rate of sexual harassment

(Harrison, 2012). With increasing cases against women these days, they felt unsafe to move around (Fernandez et al., 2020).

Malaysia is also not exempted from facing this issue even though has been ranked third safest country in Asia by 2022 Global Peace Index (Anon, 2023). Based on the data reported by Malaysia Royal Police (RMP) in 2021, about 11,914 cases of sexual harassment involving women were recorded from 2018 to 2021 (Hadzman & Abd Halim, 2021). While the women's group, All Women's Action Society (AWAM), reported 204 cases received from January to March 2022 on its Telenita hotline comprising the sexual harassments, abuse, rape, sexual assault and many more (Ova, 2022). The statistics might not be an accurate reflection of the current situation due to non-reporting by many victims as they are scared or maybe humiliating themselves. This situation sometimes affects women physically and mentally which reducing their self-esteem and confidence, feeling frustration and hatred of men.

The government has implemented numerous initiatives to protect the rights of women as well as to ensure their safety and security. There are some strategies which have been implemented on violence against women such as establishing One-Stop Crisis Centres (OSCC) in all government hospitals, creating a dedicated emergency line called *Talian Nur 15999* which operates 24 hours daily to support victim of the violence, organizing programs (women against violence) to educate their rights and how to deal with emergency situations and many more. Despite the various solutions that have been done to curb the problem, women's criminal cases are still increasing day by day (Peer Mohamad & Dahnil, 2021; Anuar 2019). Thus, it is critical to provide alternatives to resolve this problem.

Related Works

In facing a situation that threatens life such as robbery, kidnapping or raping, victim usually fall in a state of panic and difficult to think rationally on how to escape. The use of a smartphone is a necessity as it can be used effectively for user's protection and personal security. Therefore, one of the suggested ways to prevent these misbehaving activities against women and act as lifeline is to empower the use of mobile applications as everyone carries their smartphone wherever they go. There are many applications that has been developed around the world with the intention to protect women while traveling around (Bhanushali et al., 2018). *SafetiPin* is one of the applications in India used to share location and provide safe routes to the user (Viswanath & Basu, 2015). *HearMe* and *GoFearless* Bangladeshi women safety application (Masud et al., 2022), *The Sojourner Peace* and *bSafe* (American application), *Ana Bella* (European application), *MehfoozAurat* (Pakistani application) and many more working persistently to defend women in the house and public places. Although these applications having competent security features, most of them are for overseas used (based on country) and not applicable in Malaysia. *SaveMe999 Blind* is one of available application in Malaysia to send emergency request, but it was designed for people with visually impaired. It also requires multiple steps before emergency requests can be sent. Another application that can be used is *SafeCity* which only allows anonymous reporting an incident of gender-based harassment, abuse, and violence and not for instant help (Durai, 2020).

Women Safety application has been developed and designed as a medium to assist Malaysia' women against violence and receive help when needed. This safety application is purposely designed to send alerts to victim's contact lists who can help and act quickly. The victim can send their real time location to the contact lists, and this is done using a method called Geolocation. Geolocation is the process of finding a point's latitude and longitude (lat/long) coordinates. It is helpful in many different study fields. It improves internet mapping and characterization by connecting the internet graph to real node positions (Shavitt et al., 2014).

Geolocation has the capability to track a device's location using GPS, mobile phone or Wi-Fi combination. Furthermore, GPS systems can locate a person's exact latitude and longitude (Sangeetha et al., 2015). Commonly, geolocation uses Global Positioning System (GPS) and other related to geolocation technologies to specify geographical locations. Geolocation can locate the device or person in real time. Due to the growing demand for location-based services and applications, wireless geolocation has taken over as the main method of human communication (Shakir et al., 2023). Thus, geolocation is essential to be applied in this project to help the application to track the current location of a user, which is a potential victim.

System Development

The Women Safety application uses the Waterfall Model method as a development process. Figure 1 shows the phases in the Waterfall Model for Women's Safety applications development.

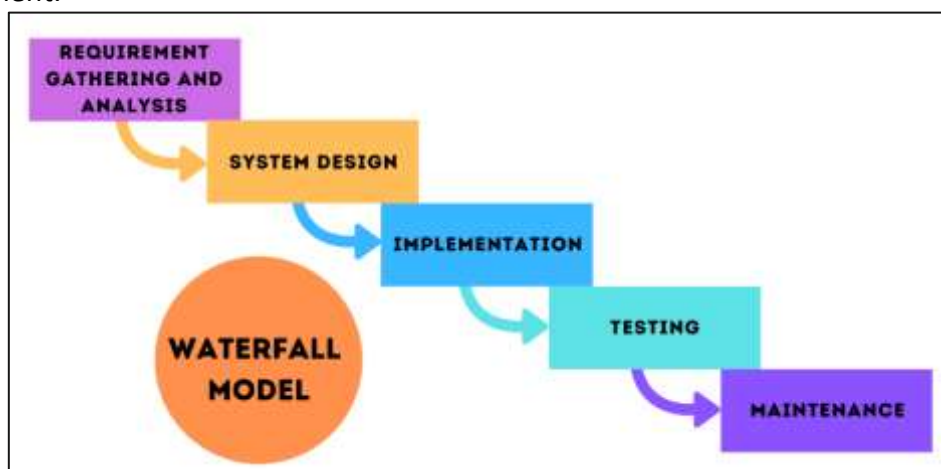


Figure 1. Waterfall Model for Women Safety Application

There are five phases in the Waterfall Model. Starting by collecting the required information regarding application and information related to Geolocation. Once all the requirements and information have been collected, the information is analyzed to ensure that the requirements are applicable for the project. In the second phase, wireframe was designed to show the flow and overview of the system including flowcharts. The third phase is implementation. In this phase, the application was coded using Java programming language based on the requirements collected in the second phase. Android Studio is used to construct the source code of the application. In the testing phase, the source code is tested which includes functional and non-functional testing to ensure that all features meet the requirements and the objectives of the systems. Finally, the fifth phase is maintenance, where the application will be improved based on user feedback. This phase involves the user as a client because the requirements of the application are made based on the user's requirements. If the issue persists or the application does not satisfy the user's needs, this step will be repeated.

System Architecture

An architectural diagram is a visual representation that shows the entities of the system, the association, limitations, and boundaries between each entity. There are eight entities in the Women Safety Application architecture diagram consisting of GPS satellite, user, list of contact numbers, SOS alarm, emergency call, GPS system, contact and internet. Each of these entities has an association with each other. Association between entities begins with the GPS satellite start sends a signal to the user when the user uses the application. Before users use

the GPS system, they need to ensure their smartphone is connected to the internet and location service is activated to ensure their current location can be tracked.

GPS will read the latitude and longitude of the user's current location. Once the GPS has obtained the latitude and longitude of the user's current location, it will send the current location to all the contact numbers that have been saved in the application. The contact list will receive a notification of the user's current location via SMS. They will get a Google Map link message. They must also be connected to the internet to open the user's current location via Google Maps.

Other entities such as contact number lists, emergency calls and SOS alarms are the main features in this application besides sharing current location. For the list of contact number feature, users can add contact numbers, save, edit, and delete them. Users can also enter an emergency number that can be called immediately if something happens. For emergency calls, when the user clicks the button, it will directly connect to the emergency number that has been saved. And finally, an SOS alarm helps users who are in dangerous situations to get help from people around them. Figure 2 below shows the Architecture Diagram for Women Safety Application.

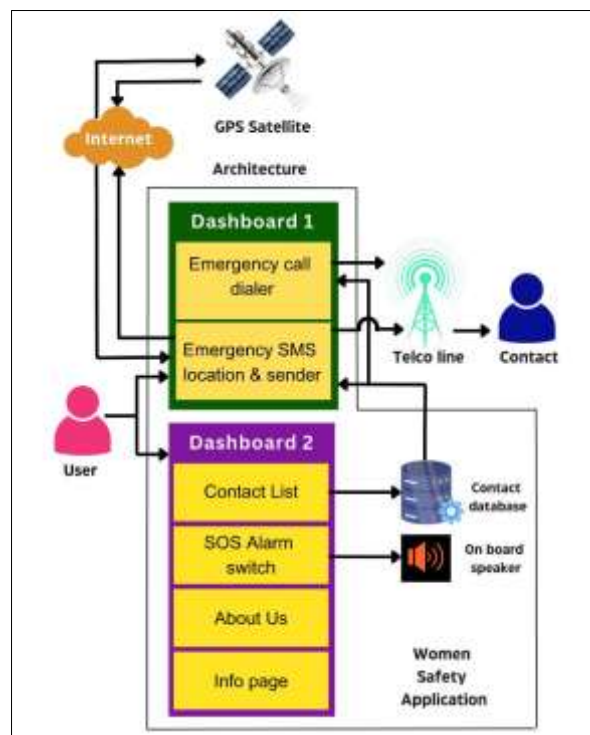


Figure 2. Architecture Diagram for Women Safety Application

Figure 3 shows the flowchart of the application. Starting with the user clicking on the "Get Started" button on the main page, it will go to the next page which is the first dashboard page. On the page, there are 3 buttons consisting of an emergency call, emergency SMS and dashboard button. If the user clicks on the emergency call button, the application will automatically dial the emergency number immediately.

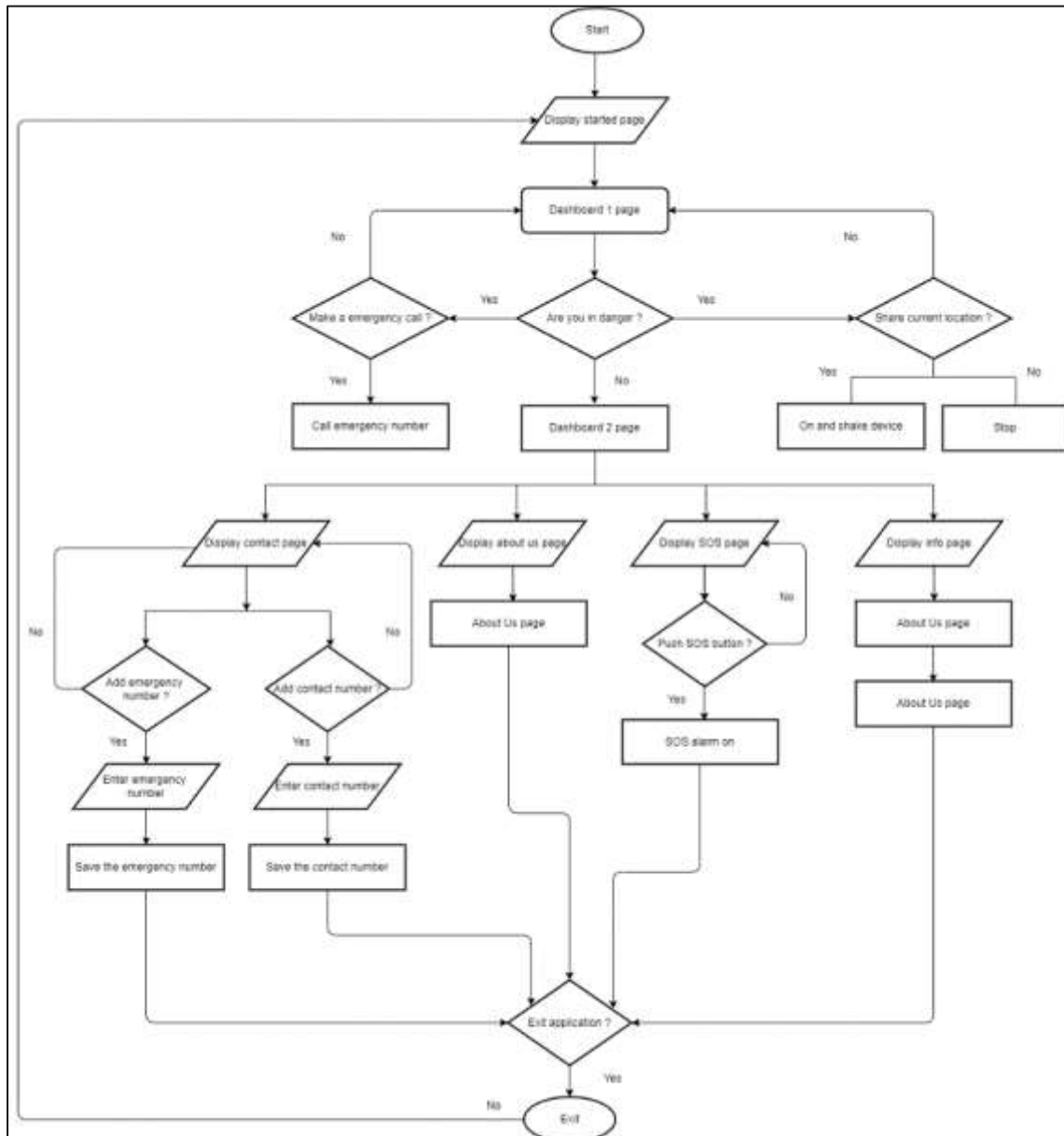


Figure 3. The flowchart of the Women Safety Application

Meanwhile, if the user clicks on the SMS emergency button, the application will display the next page which is SMS emergency where on that page, there are two buttons that work to share and send SMS the current location to the contact list and a button to stop the application from sharing the user's current location. If the user clicks on the dashboard button, the application will display the second dashboard page. On the second dashboard page, there are four buttons that represent side features in this mobile application, which are the contact button for the user to save a list of contacts and emergency numbers, the SOS alarm button for the application to make a sound if something dangerous happens or to get the attention and help of people around, an about us button that displays application information and an info page button that contains information about information and a collection of self-defense videos for women. Each page will have bottom navigation to make it easier for users to use this application except for the main page and first dashboard page.

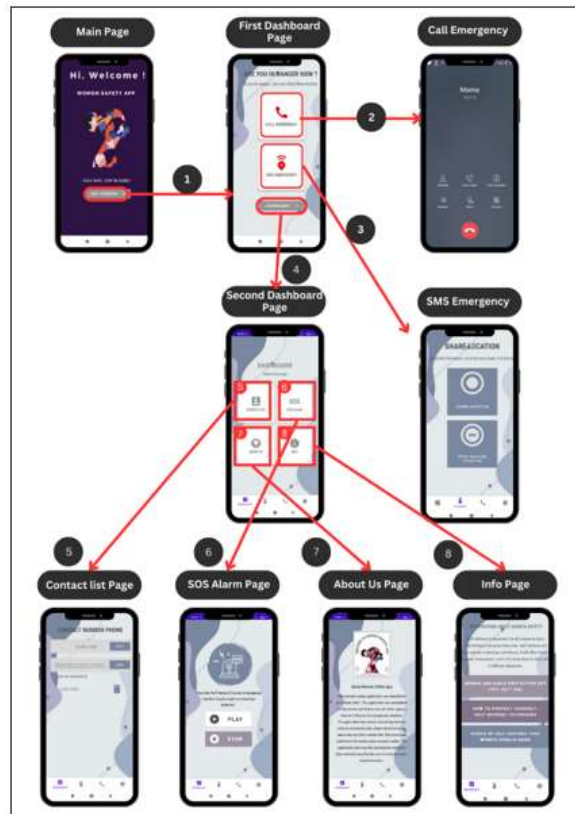


Figure 4. The interface flow of the Women Safety Application

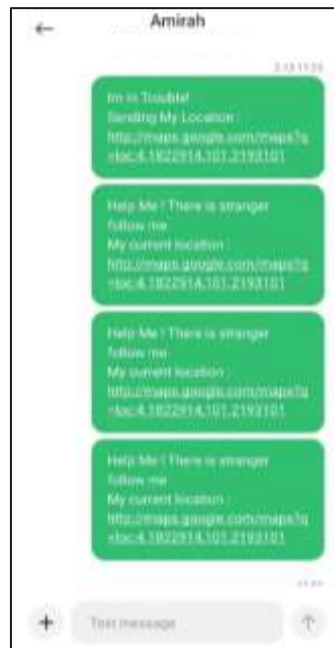


Figure 5. SMS that will be received by victim's contact list.

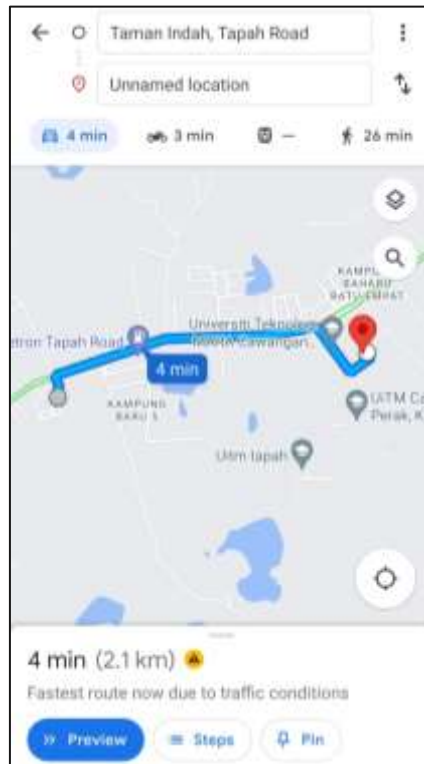


Figure 6. Current location user on Google Maps.

Figure 5 shows an example of an SMS received by all the contact lists stored in the application. The message will contain a link to Google Maps that shows the user's current location based on the given latitude and longitude. When the user clicks on the link, it will open the Google Maps application. While figure 6 shows the current location of the user on Google Maps. The Google Maps app will display the location and distance between the contact and the user. This will make it easier for contacts who come to help to find out the user's current location.

Functional Testing Result

There are two tests conducted in this project, functional and non-functional testing. Functional testing used to verify each function or feature in the application performs as required. Meanwhile, the non-functional test focuses on the performance, reliability, and usability of the application towards user's expectation (Hamilton, 2023). After the application is completed and installed in the physical device, a test plan is carried out by the developer and subject matter expert (system development expert) to determine whether the developed application meets the project requirements and project objectives. This will allow the developer to identify any errors in the application. This development process will be repeated until all functions work as intended. If not, the function is considered failed and need some improvements (Azlin & Aman, 2022). Table 1 shows the result for all features of the Women Safety Application that have been tested. Based on the results, all features are pass and successfully work as expected.

Table 1

Results of the mobile application's features work

No	Test Cases	Expected Output	Actual Output
1	Click on "Get Started" button	It goes to the next page	Pass
2	Click on "Emergency call" button	Successfully call the emergency contact number immediately	Pass
3	Click on "Share Now" button	Successfully share the user's current location to the contact list	Pass
4	Click on "Stop Share" button	Successfully stop share the user's current location to the contact list	Pass
5	Click on "Dashboard" button	It goes to the next second dashboard page	Pass
6	Click on "Add emergency number" button	Successfully add emergency contact number	Pass
7	Click on "Add new contact number" button	Successfully add new contact number	Pass
8	Click on "Edit contact list number" button	Successfully edit list of contact number	Pass
9	Click on "Delete list of contact number" button	Successfully delete list of contact number	Pass
10	Click on "Play Button" button	Successfully emits the sound of siren	Pass
11	Click on "Stop Button" button	Successfully stop the sound of siren	Pass
12	Click on all button on bottom navigation	Successfully go to the button page	Pass

Conclusion

This application is still under trial process and needs to go through the non-functional test which will be carried out soon. However, three objectives in this project which are to design a women's safety mobile application using the Geolocation method to track the current location, to develop an android application for women's safety and to test the functionality of this mobile application successfully achieved. There are still some limitations to this application. One of the limitations is that an internet connection is required to use the application. Internet is essential when using this application because it uses GPS to get the user's current location. If there is no internet, GPS was unable to read the location. The second limitation is to always make sure the phone has sufficient credit balance (if prepaid) to send SMS and make emergency calls. Otherwise, the user cannot send the message to all the contacts saved in the application.

In future, there are some recommendations that can be added to the application for improvement. First recommendation is that this application can be used even without an internet network. The second recommendation is that this application can have a share

location live stream just like the function in WhatsApp that allows users to share their live location. So, it's easier to contacts to always monitor and track user's current location. The last suggestion is that this application can be implemented on iOS devices.

Acknowledgements

The authors would like to thank the Universiti Teknologi MARA Perak Branch and the College of Computing, Informatics & Media for the supports and facilities provided in the completion of this project.

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