

Women SOS Safety App

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Abstract: Emergency response can benefit from smartphone apps for portable devices. One such tool is GPS technology, which, in addition to enabling communication, can also be used to locate rescuers by signaling their location. In an emergency, the user may press the emergency alert button to instantly email an emergency pre-programmed message to emergency contacts along with the user's current GPS position. The purpose of this project is to develop a smartphone application for locating, identifying, and alerting victims' whereabouts. The Women SOS Safety App was developed using the System Development Life Cycle (SDLC) waterfall approach. The app was built using this suggested methodology because the requirements for the app were well-defined and the timeline for development was tight. This app is to support users who are in immediate need of assistance and to keep them in touch with their loved ones by instantaneously sending a photo, GPS information, and other details at critical times. In conclusion, utilizing this app will offer the quickest and most straightforward method of seeking assistance in an emergency.

Keywords: Safety Application, SOS, Global Positioning System (GPS)

1. Introduction

Women's safety is widely discussed everywhere nowadays. Women's safety at night and sometimes even during the day when traveling alone is a concern. Sometimes we just can't prevent emergency situations from happening around us, which could be accidents, fire, robbery, or health problems. When faced with these problems, we will try our best to deal with the problems by seeking proper assistance in the shortest time possible [1]. The "Women SOS Safety App" project is a mobile-based application that will be developed quickly, easily, and efficiently in this project. The application is therefore developed with an effective and easy user interface to make the user feel easier and less burdensome when the application needs to be operated.

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The basic concept of the mobile application that is being developed in this project will be when the user first accesses the application and asks the user to register with their name and email address. After that, the user needs to add emergency contacts, set up alert messages, and check in messages. In addition, an emergency function with an easy-to-click emergency button immediately sends a pre-programmed emergency message with GPS information to the selected contacts. Locate Me function enables users to send their GPS information to a list of contacts that allows them to view the location on a map. This feature is very useful to keep the contacts up to date if the user is on a journey or unfamiliar location. Check In function able to send personalized messages to the contacts along with photo and GPS information when the user is out on another adventure. The Facebook alert message is also available in this feature. When the user clicks on Facebook, the pre-saved alert message will be displayed on the user's timeline.

Women may panic in emergency situations, which may prevent them from notifying their guardians or family members of their situation. In this case, if women are not panicking but they have been kidnaped, she might not know the location where she is being kidnapped. Furthermore, there are no locate me and check in functions. During an emergency, most of the applications only be used during emergencies not to notify the contacts about their whereabouts. Therefore, Women SOS Safety App is developed to solve this problem. The objective of this application is to design a mobile application for alerting, notifying, and locating victims' whereabouts. Next, to develop a mobile application that can be used for personal safety to protect in emergencies and to evaluate the proposed Women SOS Safety App as a simple medium to create awareness.

2. Literature Review

A literature survey was conducted to ensure that the Women SOS Safety App reflects both the advantages and disadvantages of other systems. The survey reviewed the advantages and disadvantages of existing women's safety apps to ensure that the development of the Women SOS Safety App runs smoothly. The identified disadvantages in other systems can be used as a guide to avoid them in the Women SOS Safety App. The advantages of other systems also provide guidance to improve the quality of the application. In addition, the literature survey gave knowledge about the various types of facilities that can be added and provided in the Women SOS Safety App. This information can be used to create a more comprehensive and user-friendly app. The survey also provided a way to obtain ideas for new elements that can make the Women SOS Safety App different and more interesting than existing apps.

Table 1: Comparison of existing systems with proposed application

Modules	Emergency Handling System [2]	RescueMe Application [3]	Safety Triggering System [4]	Proposed Application
Login	Yes	Yes	Yes	Yes
Register	Yes	Yes	Yes	Yes
Emergency Alert Function	Yes	Yes	Yes	Yes
Locate Me Function	No	No	No	Yes

Modules	Emergency Handling System [2]	RescueMe Application [3]	Safety Triggering System [4]	Proposed Application
Check In Function	No	No	No	Yes
Post Emergency Status Function	No	No	No	Yes
View Account History	No	No	No	Yes
Siren Function	No	No	No	Yes
Account Settings	Yes	Yes	Yes	Yes

3. Methodology

The methodology that has been selected for the development of Women SOS Safety App is Waterfall Model. The software development life cycle (SDLC) is a framework for determining which tasks will be completed at each stage of a system's development [5].

3.1 Waterfall Model

The software development life cycle (SDLC) is a framework for determining which tasks will be completed at each stage of a system's development [6]. The Waterfall Model, according to [7], is a sequential software development process in which progress is thought to be flowing downward (like a waterfall) through a list of phases that must be completed for software development to be successful. The waterfall Model is suitable for use in developing this project. It's because the Waterfall Model is best for small projects with simple and obvious system requirements [7]. In addition, Waterfall Model has several consecutive phases where these phases must be completed one by one and can only proceed to the next phase when the previous phase is fully completed [7]. This can prevent the occurrence of phase overlap.

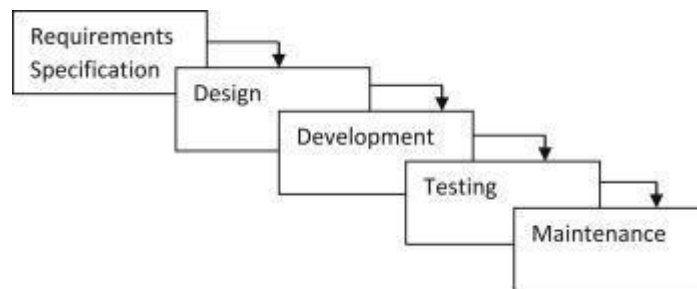


Figure 1: Waterfall Model [7]

3.2 Planning Phase

The activity of identifying the problem's background was carried out by survey users throughout the planning phase. Based on this method, it was found that the existing systems for users do not have to locate me function, check in function, post-emergency status function, view account history, and siren function. In addition, the project's objectives and scopes are defined during this phase. The proper methodology for developing this project has been determined after identifying the background of the problem, objectives, and scope.

3.3 Analysis Phase

In the analysis phase, activities to identify system requirements were carried out. Emergency Based Handling System, RescueMe, and Safety Triggering System are three existing systems that have been chosen and studied. After identifying the system requirements, an analysis of those requirements has been carried out more carefully. System requirements will then be translated into the form of a class diagram, sequence diagram, context diagram, and activity diagram. Following that, the required hardware and software are discovered and evaluated. Next, the programming language to be used has also been determined according to the suitability of the system. As a result of this, system requirements specification documents and study documents on equivalent systems have been produced.

3.4 Design Phase

During the design phase, the class diagram, sequence diagram, context diagram, and activity diagram have been designed based on the system requirements that have been analyzed in the previous phase. Then, the interface for the developed system is also designed according to the user's suitability. The interface design sketch for each module available in the developed system will be sketched using Microsoft Office Word 2016 software. The database for the developed system is also designed in this phase, relying on the context diagram, class diagram, sequence diagram, and activity diagram that have been generated. In addition, system interface sketches and system database sketches are also produced.

3.5 Development Phase

In the development phase, system development activities by creating programming code have been carried out. Women SOS Safety App is an android application that can be accessed through any smartphone. Therefore, the appropriate programming languages to develop this application are Extensible Markup Language (XML) and JAVA for application interface programming and SQLite for server programming. System development will begin by developing an interface for each module available in the system. Then, a database for the system is built.

3.6 Testing Phase

In the testing phase, system functions and interfaces are tested to ensure the system is functioning properly and has no problems with system functionality. System testing is also done on the user to find out if the system meets the needs of the user and the purpose for which the system is developed. At the end of this phase, a function and interface test document of the system and user test documents are generated.

3.7 Maintenance Phase

In the maintenance phase, system modifications and improvements are made based on user feedback and results from the testing phase. Modifications and improvements are carried out to meet the needs of users.

4. Analysis and Design

In the system requirements analysis, several diagrams have been produced to translate the system requirements that have been obtained in the previous chapter into a more easily understood and clear form. This diagram will be used as a reference and guide when designing Women SOS Safety App. Use Case Diagram, Sequence Diagram, Activity Diagram, and Class Diagram are some of the diagrams that will be developed. Furthermore, the functional and non-functional requirements are two major elements in the system requirements. These requirements ensure that the proposed application's capabilities can meet the project's goals. These requirements are critical in determining the app's usefulness and quality, as well as developing an app that fits the user's needs.

4.1 Functional Requirements

A functional requirement is a set of functions and capabilities that exist in a software system or one of its components. Calculations, technical details, data manipulation and processing, and other functionality that define what a system is expected to do are examples of functional requirements. The functional requirements of the system are shown in Table 2.

Table 2: Functional description of each module

No.	Module	Functionalities
1.	Register	This module allows user to register to the application using their name, email address and password
2.	Login	This module allows user to login using their password
3.	Emergency Alert Function	This module allows user to alert people by sending emergency text including GPS location
4.	Locate Me Function	This module allows user to view and share their current location with pre-programmed message to contacts
5.	Check In Function	This module allows user to notify their whereabouts with family members or guardians by sending pre-programmed message with GPS location
6.	Post Emergency Status Function	This module allows user to post alert message on Facebook.
7.	View Account History	This module allows user to view the log details.
8.	Siren Function	This module allows user to on the siren button which produces loud siren.
9.	Account Settings	This module allows user to update their profile and emergency contacts.

4.2 Non-Functional Requirements

A non-functional requirement is one that sets criteria rather than behaviors that can be used to judge the operation of a system. It's a requirement that specifies the requirements that can be considered application limitations. Table 3 lists the system's non-functional requirements.

Table 3: Non- Functional description of each module

No.	Data	Description
1.	Operational Requirement.	This application will run on a smartphone using Android Studio. The system will only work if you have an internet connection and your GPS is turned on.
2.	Usability Requirement	The application offers users a variety of modules as well as fascinating, user-friendly and easy-to-understand applications.
3.	Security Requirement	User must first input their email and password to use the application.
4.	Portability Requirement	The application is portable because it can operate on any Android smartphone

4.3 Use Case Diagram

A use case diagram is a visual representation of a user's interaction with a system that demonstrates the user-system connection. There is one actor which is the user in the use case diagram. There are nine use cases consisting of register, login, emergency alert function, check in function, locate me function, post-emergency status function, view account history function, siren function, and account settings. Figure 2 shows the use case diagram of the proposed system.

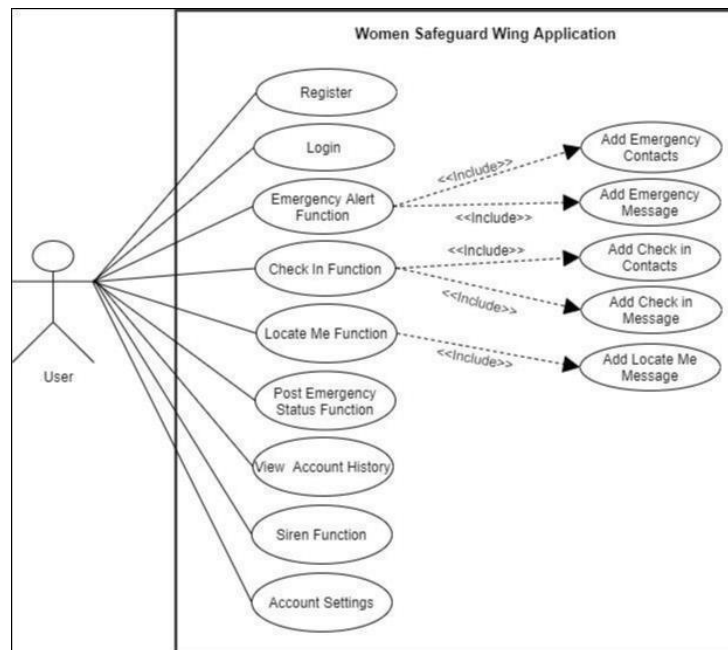


Figure 2: Use Case Diagram

4.4 Sequence Diagram

A sequence diagram is used to show the interactions in this application in greater depth. This implies that the diagrams give a general idea of the actor's performance sequence as well as the correct order in which each event should occur. It also demonstrates how different objects interact with one another. It also shows how objects interact with each other. Figure 3 shows the sequence diagram of the proposed system.

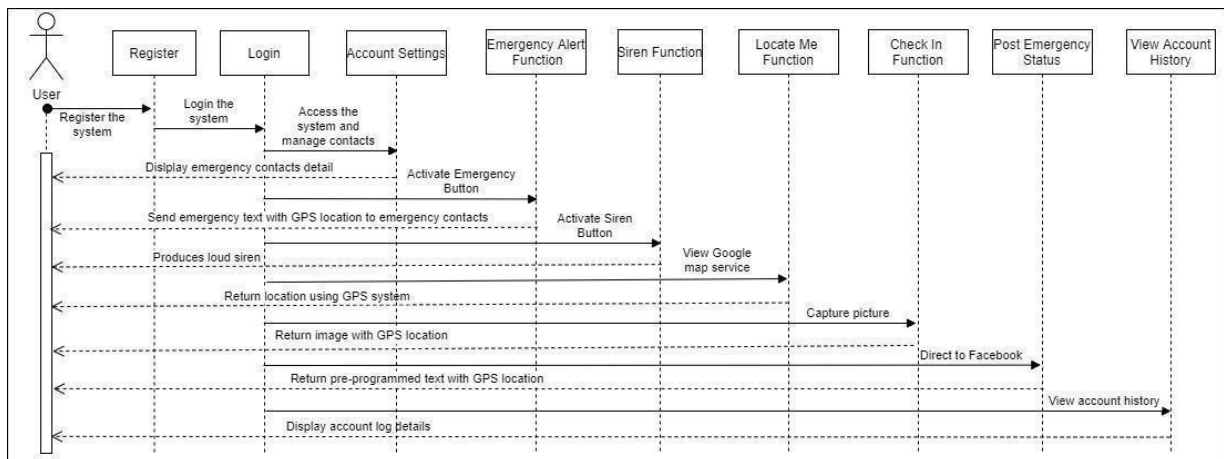


Figure 3: Sequence Diagram

4.5 Activity Diagram

Stepwise selection, iteration, and concurrency management are all supported by activity diagrams, which are graphical representations of activities workflow and actions. One of the UML specifications is the activity diagram. The flow of activities centered on the use case or detailed design methodologies is shown in the activity diagram. There are various symbols used in flow charts in activity diagrams, including input, output, processes, and data flow. Figure 4 shows the activity diagram of proposed system.

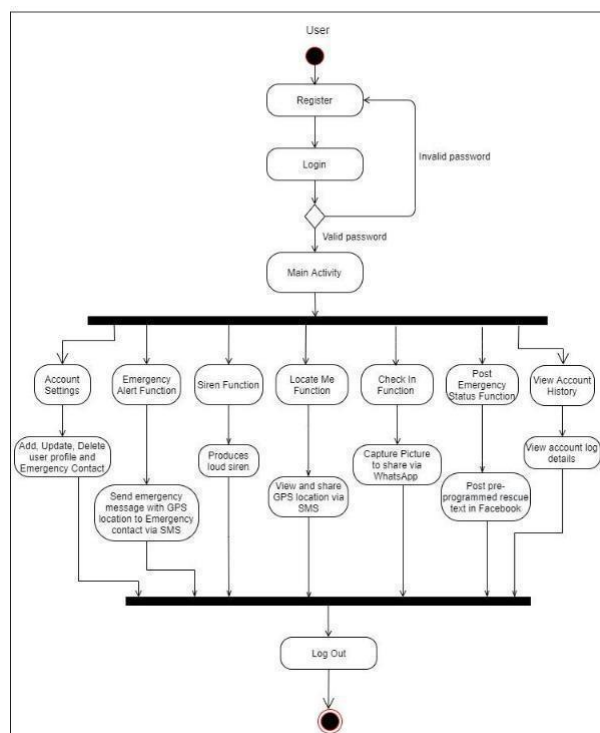


Figure 4: Activity Diagram

5. Implementation and Testing

The implementation of the developed system is described in this section. The previously created UI and database design must be implemented by installing Android Studio. Programming is the primary activity during this stage. Writing code is essential because it is part of the process of developing and executing all of the previous plans and designs.

5.1 Database Connection

This proposed application uses the SQLite database implementation that is included in Android. SQLite is used to create, read, update, and remove data in this application. Figure 6 shows the SQLite database connection for the proposed application in Android Studio, where each function is represented by a table.

```
public class DatabaseHandler extends SQLiteOpenHelper {

    // All Static variables
    // Database Version
    private static final int DATABASE_VERSION = 1;

    // Database Name
    private static final String DATABASE_NAME = "MySafetyGuard";

    private static final String TABLE_EMERGENCY = "emergency";
    private static final String TABLE_CHECKIN = "checkin";
    private static final String TABLE_HISTORY_EMERGENCY = "historyemergency";
    private static final String TABLE_HISTORY_LOCATEME = "historylocateme";
    private static final String TABLE_HISTORY_CHECKIN = "historycheckin";
    private static final String TABLE_HISTORY_EMERGENCY_DATA = "historyemergencydata";
    private static final String TABLE_HISTORY_LOCATEME_DATA = "historylocatemedata";
    private static final String TABLE_HISTORY_CHECKIN_DATA = "historycheckindata";

    private static final String KEY_EMERGENCY_ID = "emergencyid";
    private static final String KEY_EMERGENCY_MSG = "emergencymsg";
    private static final String KEY_EMERGENCY_NAME = "emergencyname";
    private static final String KEY_EMERGENCY_PHONE = "emergencyphone";
    private static final String KEY_EMERGENCY_EMAIL = "emergencyemail";
    private static final String KEY_EMERGENCY_IMAGE = "emergencyimage";
    private static final String KEY_EMERGENCY_COLOR = "emergencycolor";

    private static final String KEY_CHECKIN_ID = "checkinid";
    private static final String KEY_CHECKIN_MSG = "checkinmsg";
    private static final String KEY_CHECKIN_NAME = "checkinname";
}
```

Figure 6: Source Code for SQLite Database Connection

5.2 Application Interfaces

This section will show the interfaces of the application system.

5.2.1 Register Interface

Figure 7 shows the register interface of the proposed application. User need to register only for the first time in order to use this application. User need to enter their name, email, and password and retype the password to continue to the next interface. The user’s data is saved to the SQLite database.

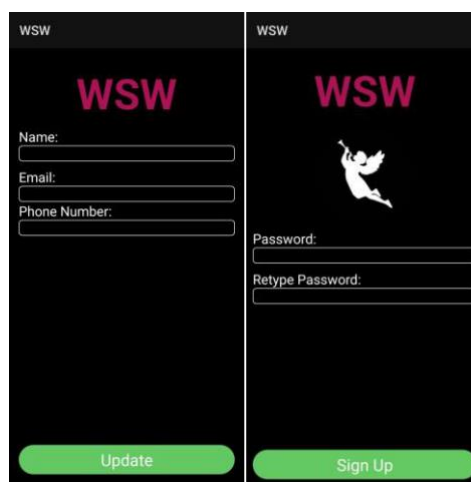


Figure 7: Register Interface

5.2.2 Login Interface

Figure 8 shows the login interface of the proposed application. The user signs in using the password. After the verification is successful, the user will be redirected to the home (emergency) page of the proposed application.

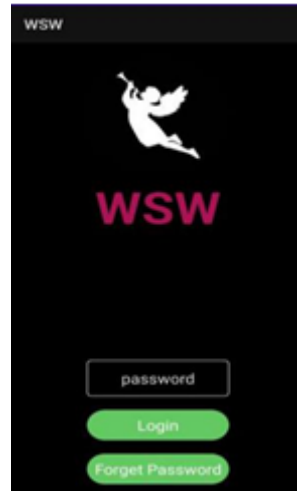


Figure 8: Login Interface

5.2.3 Emergency Interface

Figure 9 shows the emergency interface of the proposed application. This page contains an emergency alert function and a siren function. User can click the emergency button to send pre-programmed message with location to their contacts via email. User also can click on the siren icon to allow the application runs and produce a loud siren.

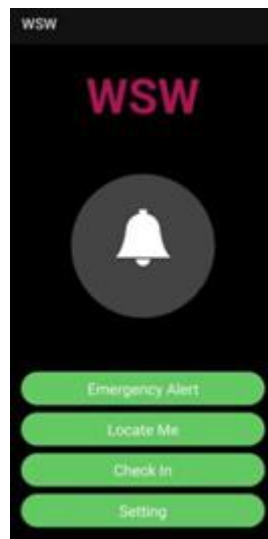


Figure 9: Emergency Interface

5.2.4 Locate Me Interface

Figure 10 shows the locate me interface of the proposed application. This interface contains the current GPS location of the user. User can notify contacts by sharing their GPS location with the pre-programmed message.

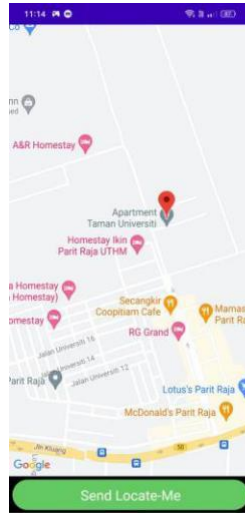


Figure 10: Locate Me Interface

5.2.5 Check In Interface

Figure 11 shows the check in interface of the proposed application. This interface enables user to snap image and share GPS location with pre-programmed message to keep in touch with their contacts. User can click the Send Check-In icon to share their pre-programmed message with GPS location.



Figure 11: Check In Interface

5.2.6 Emergency Message Setting Interface

Figure 12 shows the emergency message setting interface of the proposed application. This interface contains edit messages. User can edit in Emergency Alert Message, Locate Me Message, and Check In Message. User can update pre-programmed message in settings.

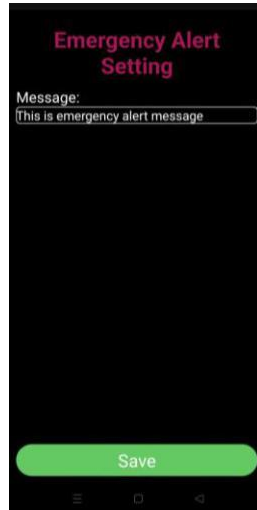


Figure 12: Emergency Alert Message Setting

5.2.7 View Account History Interface

Figure 13 shows the view account history interface of the proposed application. This interface enables user to view the log details of Emergency, Locate Me and Check In Contacts.

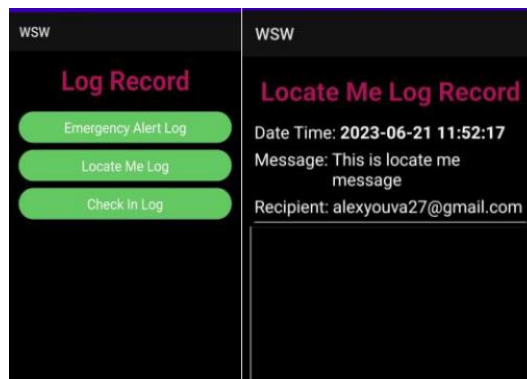


Figure 13: View Account History

5.3 Testing

Women SOS Safety Application is tested and documented using functional system testing during the testing phase. Testing is necessary to determine whether the application contains any errors and to assure that the application meets the project's requirements. The results of the functional testing of this application are shown in Section 5.3.1.

5.3.1 Functional Testing

The purpose of functional testing is to ensure that all the application's components and features function efficiently. This is done to make sure that the system performs and functions as it should. Testing elements are combined into test plans based on various test cases for each module. The test reports for the functional testing done on each module in this system are presented in the subsections below.

5.3.2 Test Plan

After the proposed application is installed, the test plan is carried out. It can be used to determine whether the application meets the project's objectives. Tables 4 to 9 show the test plan for all the elements of the Women SOS Safety Application.

Table 4: Test Plan for Login

No	Test Cases	Expected Output	Actual Output
1	Enter valid password	A message box with the text "Login successful" will popup if the login is Successful	As expected
2	Enter invalid password	If the login attempt fails, a dialog box displays with the message "Password is wrong. Please try	As expected
3	Click forget password	"Email success" dialogue will appear once successfully send user's password to their registered email.	As expected

The test plan for the user login interface is shown in Table 4. This module can test with the user's password as input.

Table 5: Test plan for Registration

No	Test Cases	Expected Output	Actual Output
1	Register using correct email and password	Registration successful and display login page.	As expected
2	Enter incorrect email address	Error message will be displayed to enter valid email address.	As expected
No	Test Cases	Expected Output	Actual Output

3	Enter incorrect password	Error message will be displayed to enter valid password.	As expected
4	Attempt to register with zero input.	Error message will be displayed to fill in empty fields.	As expected

The test plan for the user register interface is shown in Table 5. The user's email address and password will be on this screen, and they will be able to proceed to the application's next interface.

Table 6: Test plan for Emergency Alert Function

No	Test Cases	Expected Output	Actual Output
1	Allow permission on location setting	The system sends an emergency text with GPS location by single click.	As expected
2	Disallow permission on location setting	The system will repeat permission pop up message for user.	As expected

The test plan for the emergency alert function is shown in Table 6. In this interface, user alerts their contacts by sending an emergency text.

Table 7: Test plan for Locate Me

No	Test Cases	Expected Output	Actual Output
1	View current location	Display integrated Google maps view with user's current location.	As expected
2	Click send my GPS location	Select contact from user contact list and send GPS location with pre-programmed message.	As expected

The test plan for locate me is shown in Table 7. In this activity, user should be able to view and share their current location.

Table 8: Test plan for Locate Me

No	Test Cases	Expected Output	Actual Output
1	View emergency History	Log details of emergency will be displayed.	As expected
2	View locate me History	Log details of locate me will be displayed.	As expected
3	View check in history	Log details of check in will be displayed.	As expected

The test plan for view account history is shown in Table 8. Users should be able to access log details through this interface.

Table 9: Test plan for Siren Function

No	Test Cases	Expected Output	Actual Output
1	Click siren button for first time	Loud siren will be produced repeatedly.	As expected
2	Click siren button for second time	Siren will be stopped.	As expected

The test plan for siren function is shown in Table 9. Users should be able to activate the siren button on this interface, which will emit a loud siren.

6. Conclusion

The Women SOS Safety App will be designed and developed to meet user requirements and ensure a smooth user experience. The app will provide users with all the features necessary to seek assistance in an emergency. Phone authentication will be used for the registration and login features, and the app will allow users to send their GPS location and a pre-programmed message with a single button press. The locate me and check-in functions will be implemented to send GPS location and photos to contacts. The registration of emergency contacts will be implemented successfully, and the app will integrate with Google Maps to allow users to share their current location.

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