

Women Safety Monitoring and Emergency Alert System

Sudha K

Department of Computer Science
and Engineering,
Sri Krishna College of
Engineering and Technology,
Coimbatore, Tamil Nadu, India

Rithick P

Department of Computer Science
and Engineering,
Sri Krishna College of
Engineering and Technology,
Coimbatore, Tamil Nadu, India

Praneethha R B

Department of Computer Science
and Engineering,
Sri Krishna College of
Engineering and Technology,
Coimbatore, Tamil Nadu, India

Puja Tamildurai

Department of Computer Science and
Engineering, Sri Krishna College of
Engineering and Technology,
Coimbatore, Tamil Nadu, India

Rohit G S

Department of Computer Science and
Engineering, Sri Krishna College of
Engineering and Technology,
Coimbatore, Tamil Nadu, India

Abstract: A smartphone application called the Women Safety Monitoring and Emergency Alert System (SheShield) was created to offer efficient and prompt safety support in an emergency. MySQL is used for database management, Java Spring Boot is used for the backend, and Flutter with Dart is used for the frontend. It offers emergency contact management, profile management, safe user registration, and authentication. A Safety Dashboard that offers rapid access to crucial safety features is part of the application. The SOS Emergency Alert, which records the current GPS location and transmits the emergency request to the backend, can be activated by the user in an emergency. The user's latitude and longitude are recorded by the GPS Location Monitoring Module, which then links the data to the current emergency. The Live Emergency Module keeps track of the current emergency situation and gives authorized guardians up-to-date information. Registered guardians can safely obtain emergency status and location data using the Guardian Module. Based on the user's emergency location, the Emergency Volunteer Assistance Module assists in locating volunteers in the area. Additionally, the system offers a Safety Heatmap for locating safety-related regions and an Evidence Vault for keeping track of safety-related incident data. Extra functions like Fake Call, Smart Walk, and Nite Safety give consumers better help in various scenarios. Emergency information can be sent to registered contacts via the application's calling and SMS features. REST APIs, Spring Security, BCrypt password hashing, Controllers, Services, Repositories, Entities, DTOs, and Exception Handling are all used in the backend's modular architecture. User, guardian, emergency contact, volunteer, location, and emergency records are all safely managed using MySQL. SheShield offers a useful, safe, and easily available solution for women's safety by combining emergency alerting, GPS monitoring, guardian supervision, volunteer aid, communication, and preventive safety elements into a single platform.

Keywords: SheShield, Flutter, Dart, Java, Spring Boot, MySQL, SOS Alert, GPS Location Tracking, Real-Time Monitoring, Guardian Monitoring, Emergency Volunteers, REST API, Spring Security, BCrypt, Emergency Contacts, Safety Heatmap, Nite Safety, Smart Walk, Fake Call, Evidence Vault, Calling, and SMS Alerts.

I. INTRODUCTION

In contemporary society, women's safety has grown in importance, especially in emergency scenarios such as dangerous travel, harassment, accidents, and other dangerous situations. The likelihood of getting help in a timely manner can be greatly increased in such circumstances by being able to promptly speak with reliable individuals and offer precise location information. Conventional safety measures sometimes rely on manual phone calls or messages, which might be challenging to carry out when someone is stressed out or unable to communicate clearly. A sophisticated and easily available safety system that can offer emergency alarms, location tracking, communication, and support via a single platform is therefore required.

The quick development of GPS-based services and mobile technology has made it possible to design useful applications for personal safety. Smartphones can offer communication capabilities, real-time location data, and rapid access to emergency services. Nevertheless, a lot of current safety apps may not offer an integrated set of capabilities for volunteers, guardians, emergency communication, preventive safety, and incident management; instead, they may concentrate only on SOS notifications or location sharing. Therefore, a robust system should integrate several safety measures while preserving secure access to sensitive user and emergency data.

SheShield, the proposed Women Safety Monitoring and Emergency Alert System, is a mobile-based safety platform that uses MySQL for database administration, Java Spring Boot for backend processing, and Flutter with Dart for the frontend. For user registration, authentication, profile administration, and emergency contact management, the system offers a safe environment. Users can quickly access emergency and preventive safety features through a single safety dashboard. The system is intended to assist users prior to, during, and following an emergency.

The SOS Emergency Alert Module provides the main emergency functions. The system retrieves the current GPS coordinates, including latitude and longitude, and transmits the emergency request to the backend when the user presses the SOS button. The registered guardians, emergency contacts, and volunteers who are available can then be linked to the emergency information. Authorised guardians can access accessible emergency information and location details through the Guardian Monitoring Module, while the Live Emergency Active Module keeps track of the current emergency state. By locating local volunteers who might be able to help based on the emergency location, the Emergency Volunteer Assistance Module improves the system even further.

SheShield offers a number of preventive and supporting safety elements in addition to emergency response. Based on existing safety data, the Safety Heatmap Module aids users in comprehending topics connected to safety. While the Smart Walk Module helps users when walking, the Nite Safety Module offers further assistance when traveling at nite. A simulated calling feature offered by the Fake Call Module might assist users in escaping awkward or possibly dangerous circumstances. In order to communicate with registered emergency contacts and exchange pertinent location and emergency information, the system also offers calling and SMS capabilities.

Because the proposed system manages personal data, emergency contacts, geographical information, and incident recordings, security is a crucial component. Spring Boot REST APIs are used to implement the backend, while Spring Security facilitates authorization and authentication. While MySQL offers persistent storage for user accounts, guardian details, emergency contacts, volunteer information, location records, and emergency events, BCrypt hashing protects passwords. Controller, Service, Repository, Entity, DTO, Configuration, and Exception Handling components make up the backend's modular architecture, which enhances organization, scalability, and maintainability.

The suggested system's primary contributions are:

1. To create a mobile platform for women's safety that incorporates communication, emergency response, location tracking, and preventive safety elements.
2. To offer an SOS Emergency Alert Module that, in dire circumstances, generates an emergency request based on the user's current GPS location.
3. To improve the availability of prompt assistance during emergencies by offering Guardian Monitoring and Emergency Volunteer Assistance.
4. To offer further safety features including the Evidence Vault, Smart Walk, Safety Heatmap, Nite Safety, Fake Call, Calling, and SMS communication.

5. To create a secure backend for handling application data and safeguarding user information using Java Spring Boot, REST APIs, Spring Security, BCrypt password hashing, and MySQL.

This is how the rest of the paper is structured. The literature on women's safety applications, emergency alert systems, GPS-based monitoring, mobile safety technologies, and location-based help is reviewed in Section II. The suggested approach, system architecture, database design, user authentication, SOS processing, GPS monitoring, guardian access, volunteer support, and other safety modules are all covered in Section III. The implementation and experimental findings, including the creation of emergency alerts, position tracking, guardian monitoring, volunteer support, and communication features, are shown in Section IV. The study's conclusion and potential improvements are covered in Section V. These include better real-time monitoring, intelligent risk identification, integration with emergency services, sophisticated location analysis, and improved volunteer coordination.

II. LITERATURE REVIEW

In recent years, there has been a growing focus on the use of location-based services, GPS technology, real-time communication, and mobile applications to enhance women's safety. Studies already conducted show that cellphones can offer real-time location sharing, connection with reliable contacts, quick emergency warnings, and other safety-support features. Integrating emergency response, guardian monitoring, volunteer support, preventive safety features, and secure data management into a single platform is still difficult, though. The following studies served as the foundation for the creation of the Women Safety Monitoring and Emergency Alert System (SheShield).

Saravanan and Marjudi investigated a Women's SOS Safety App that locates users in an emergency using GPS and smartphone technologies. Using the application, users can send emergency contacts a pre-programmed message with their current GPS position and activate an emergency alert. The study showed how GPS-based emergency communication can help locate users in dire circumstances. However, the system did not include an integrated guardian monitoring system, volunteer aid, or preventive safety framework; instead, it was largely focused on SOS notifications and location sharing.

Verma and Singh presented Surakshit, an Android-based women's safety app that uses a straightforward emergency procedure to offer prompt aid. The application locates the user using GPS, notifies registered contacts of the location, and starts a call to a specified emergency contact. This method shows how the time needed to ask for help can be decreased by integrating location tracking with direct contact. But the primary focus of the functionality is communication and emergency notification. By adding live emergency status, guardian monitoring, volunteer support, evidence management, and other preventive safety elements, the suggested SheShield system expands on this idea.

Shake2Safety, an Android software that combines GPS tracking, real-time monitoring, voice-based crisis recognition, and SOS notifications, was studied by Khan et al. (2024). The study emphasized how crucial it is to offer a variety of ways for a user to ask for help, especially in situations where traditional mobile device engagement could be challenging. The app has helpful emergency response features, but it lacks a complete set of guardian access, local volunteer coordination, safety heatmaps, and other preventive features. SheShield uses a more comprehensive modular safety architecture to meet these needs.

Real-time notifications and location monitoring have also been the subject of recent study on Android-based women's safety applications. Bengare et al. (2025) described a system that uses communication services like SMS and WhatsApp to transmit emergency notifications with real-time GPS data to designated contacts. The study showed that communicating emergency information can be enhanced by integrating GPS tracking with several communication channels. However, rather of maintaining a full emergency lifecycle comprising guardians, volunteers, evidence, and live monitoring, the approach mainly focuses on alarm transmission and position tracking.

In order to promote women's safety, Pasha and Jagirdar (2025) created an Android application that had one-touch SOS capability, emergency notifications, fake calls, and real-time location monitoring. The study shown that while SOS and location sharing facilitate emergency response, fake-call capabilities can act as a helpful preventive safety strategy by assisting users in leaving uncomfortable situations. Nevertheless, the system lacks a comprehensive backend architecture for centralized incident recordings, emergency status management, volunteer support, and guardian monitoring. These features are integrated into a single platform in the suggested SheShield application.

Numerous applications include emergency services, location sharing, SOS alerts, reporting systems, and trusted-contact communication, according to a comprehensive review of mobile applications for preventing violence against women and girls. Real-time communication, community assistance, safe journey planning, risk-area identification, and other extensive safety features have become increasingly prevalent in more recent applications. The analysis shows a wider shift toward multifunctional safety platforms from basic GPS and SOS applications. But it also points out areas that might be improved, such as cross-platform compatibility, offline functioning, public sector cooperation, and cutting-edge technology like artificial intelligence.

Kalpana et al. (2025) investigated the Kavalan SOS application among college students and working women in Tiruchirappalli District. According to the survey, user-friendly interfaces, geographic location monitoring, and physical safety and prompt response were significant elements impacting how the program was perceived. The results highlight the significance of precise location information and quick emergency response in women's safety

applications. However, the survey also found that some user groups had comparatively lower utilization, highlighting the need for improvements in accessibility, usability, and awareness. SheShield offers several integrated safety features with an emphasis on a straightforward mobile interface.

For women's safety, Chahar and Yogi (2023) suggested an Edge AI-enabled wearable architecture that integrates sensors, GPS, GSM, IoT connectivity, and machine learning. In order to detect potential crisis situations, the system tracks biometric and environmental characteristics and can produce both local and distant alarms. The study shows how intelligent and networked technologies can be used for proactive safety monitoring. However, wearable-based solutions differ from software-only mobile safety platforms and may require additional hardware. SheShield offers volunteer support, GPS monitoring, emergency communication, guardian access, and smartphone-based safety services.

The examined research show that key elements of contemporary women's safety applications include GPS tracking, SOS warnings, emergency communication, real-time monitoring, fictitious calls, and community-based support. Many current systems, however, only concentrate on a portion of these capabilities. By combining user authentication, emergency contacts, SOS activation, GPS location tracking, live emergency status, guardian monitoring, nearby volunteer assistance, Evidence Vault, Safety Heatmap, Nite Safety, Smart Walk, Fake Call, calling, and SMS communication into a single mobile-based platform, SheShield fills this gap. A structured and secure architecture for managing users, emergency events, location data, and safety-related records is further provided by the usage of Flutter, Java Spring Boot, REST APIs, Spring Security, BCrypt, and MySQL.

III. SYSTEM ARCHITECTURE AND METHODOLOGY

Using a mobile-based architecture, the proposed Women Safety Monitoring and Emergency Alert System (SheShield) offers guardian supervision, volunteer support, emergency help, GPS location tracking, and preventive safety services. The system incorporates a MySQL database, a Java Spring Boot REST backend, and a Flutter and Dart mobile application. The process starts with safe user registration and authentication, then moves on to emergency contact management and safety dashboard access. In an emergency, the user can send the emergency request to the backend, activate the SOS function, and record the current GPS location. The emergency occurrence is processed by the backend, which then provides pertinent information to nearby volunteers and authorized guardians. Extended safety support is offered by additional modules including Evidence Vault, Safety Heatmap, Nite Safety, Smart Walk, Fake Call, phoning, and SMS.

A. SheShield Safety Processing Framework

When a registered user opens the SheShield mobile application, the suggested framework starts. The entire workflow, from user authentication to emergency support and monitoring, is shown in Fig. 1. Using the mobile application, the user first completes authentication and registration. The user can manage personal information, emergency contacts, and other safety choices on the Safety Dashboard following successful authentication. The user presses the SOS button in an emergency. The program creates an emergency request with the pertinent user and location data after obtaining the device's current GPS coordinates.

The Spring Boot backend receives the request via REST APIs. The backend handles the emergency event and verifies that the user is authentic. The emergency data is kept in MySQL, and authorized guardians have access to the current emergency state. Based on the location of the incident, the system can also locate volunteers who are accessible and offer pertinent aid details.

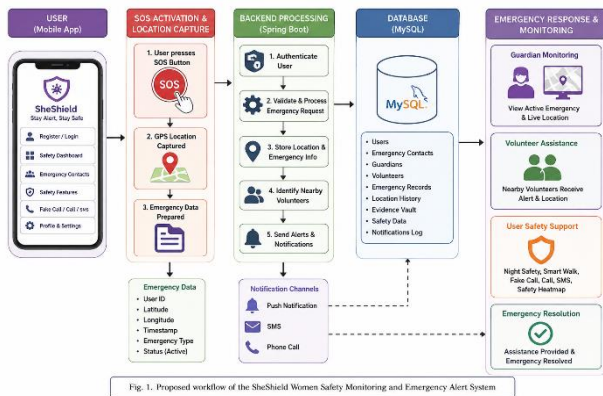


Fig. 1. Proposed workflow of the SheShield Women Safety Monitoring and Emergency Alert System

Fig. Proposed workflow of the SheShield Women Safety Monitoring and Emergency Alert System

B. User Authentication and Data Processing

Secure user registration and authentication constitute the system's initial phase. Through the Flutter app, users supply the necessary registration data. Before creating the user account, the backend verifies the data that was submitted. Passwords are not kept in plain text. Instead, password representations are safely stored on the backend using BCrypt hashing. Spring Security verifies the provided login credentials against the password hash that has been stored before allowing authorized users to log in.

The user can manage profile details, emergency contacts, guardian details, and safety preferences following a successful authentication. Before crucial data is entered into the database, input validation is carried out. This procedure lowers the number of invalid records and aids in preserving database, backend, and mobile application consistency.

The following are the main user data that the system processes:

- Information on user authentication and identification
- Details from a personal profile
- Contact information for emergencies
- Information about guardians
- GPS location data
- Information on emergency events
- Details on volunteer availability

C. GPS Location and Emergency Data Representation

Since precise position data is necessary in an emergency, GPS location plays a significant role in the suggested system. The mobile application uses the device's GPS service to get the current latitude and longitude when the user activates SOS.

The location information can be represented as:

$$L=(\text{Latitude},\text{Longitude},\text{Time})(1)$$

where Time is the time the place was recorded, Latitude is the north-south geographical position, and Longitude is the east-west geographical position.

The location that was recorded is linked to the current emergency event and sent over a REST API to the Spring Boot backend. The pertinent location and emergency data is stored in MySQL on the backend. The Guardian Monitoring Module then provides authorized guardians with access to the emergency location.

The major data categories used by the system are presented in Table 1.

Table 1. Description of dataset feature indicators

Data Group	Representative Data	Data Type
User Information	Name, Email, Phone	Text
Authentication	Username, Password Hash, Role	Security
Emergency Contact	Contact Name, Phone Number, Relationship	Text
Location Information	Latitude, Longitude, Timestamp	Numerical

D. SOS Emergency Alert Mechanism

She Shield's main emergency response component is the SOS Emergency Alert Module. The application starts the

emergency workflow right away when the user hits the SOS button.

The following steps make up the process:

1. The SOS button is pressed by the user.
2. The user's authenticated session is confirmed by the program.
3. The current GPS coordinates are acquired.
4. A request for an emergency is made.
5. The Spring Boot backend receives the emergency request.
6. The request is processed and validated by the backend.
7. MySQL is used to store the emergency event and location.
8. The emergency is now considered active.
9. The emergency information is accessible to authorized guardians.
10. It is feasible to identify nearby volunteers who might be able to help.

The emergency status can be represented as:

$$E=\{\text{User,Location,Time,Status}\}(2)$$

where Location is the current GPS position, Time is the emergency timestamp, Status is the current emergency status, and User is the person who created the alert.

States like Inactive → Active → Assistance in Progress → Resolved are possible for the emergency status to move through.

E. Guardian Monitoring and Volunteer Assistance

Authorized guardians can securely access emergency information using the Guardian Registration and Login Module. Before gaining access to classified emergency information, guardians must authenticate. The user's location and current emergency status are displayed by the Guardian Live Monitoring Module. This makes it possible for guardians to determine whether an emergency is ongoing and where help might be needed. Another support system is offered by the Emergency Volunteer Assistance Module. The system can determine available volunteers based on their registered location and availability when an SOS request is created. Geographical coordinates can theoretically be used to determine the distance between a volunteer and a user. The following is an example of a location-based distance calculation:

$$d=\text{Distance}(\text{Lu},\text{Lv})(3)$$

where Lv stands for the volunteer's registered location and Lu for the user's emergency location. Thus, emergency support can be given priority to volunteers who are located inside the necessary aid region. In addition to registered emergency contacts and guardians, this system offers an extra layer of support.

F. Live Emergency and Safety Support Modules

An emergency event's current state is maintained by the Live Emergency Active Module. The system logs the occurrence and shows authorized users the active status after SOS is enabled. The status might be updated in accordance with the resolution of the emergency.

Additionally, She Shield has a number of auxiliary safety modules:

- Evidence Vault: Offers a special location for keeping track of incident data pertaining to safety.
- Safety Heatmap: This tool helps users identify possibly safer or higher-risk places by displaying geographical information connected to safety.
- Nite Safety: Offers customers who travel at night more safety assistance.
- Smart Walk: Offers safety support when walking.
- Fake Call: This feature helps users get out of awkward situations by simulating an incoming call.
- Calling: The device dialer enables users to make calls to registered emergency contacts.
- SMS: Assists in preparing and transmitting emergency information that includes pertinent alert and location information.

These modules offer preventive and situational safety support, expanding the use beyond emergency response.

G. Backend REST API and Security Mechanism

Java Spring Boot is used to implement the backend, which has a modular design. The Flutter mobile application and the backend services can communicate thanks to REST APIs. The major backend components include:

Controller → Service → Repository → Database

The application and business logic are located in the Service layer, whilst the Controller layer handles requests from the mobile application. Communication with the MySQL database is controlled by the repository layer. DTOs are used to transport structured data between application layers, whereas entity classes are used to represent persistent

database information. Authorization and authentication are managed by Spring Security. To avoid storing plain-text passwords, BCrypt is used for password hashing. To guaranty that users, guardians, volunteers, and administrators can only access the data pertinent to their duties, role-based access can be implemented.

In order to provide controlled answers in the event of invalid requests, unauthorized access, or application faults, exception handling and input validation are also integrated.

.IV. RESULTS AND DISCUSSION

MySQL was used for database management, Java Spring Boot was used for backend processing, and Flutter with Dart was used for the mobile application of the proposed Women Safety Monitoring and Emergency Alert System (SheShield). Emergency alert generation, GPS location tracking, guardian access, volunteer support, communication facilities, and other safety-support elements are all successfully integrated into a single platform by the designed system.

A. User Registration and Authentication

To ensure safe user account creation and login, the registration and authentication module was tested. By entering the necessary information, users could register and then use their legitimate login credentials to view the safety dashboard. The system rejected the login credentials because they were invalid. Spring Security managed authenticated access to protected resources, and BCrypt hashing was used to secure passwords. The outcomes show that the system can offer users, guardians, and other authorized roles a safe authentication method.

B. SOS Emergency Alert and GPS Location

By pressing the emergency button on the user's mobile device, the SOS module was tested. The program received the device's current GPS coordinates and successfully started the emergency procedure after activation. Using REST APIs, the latitude, longitude, timestamp, and emergency status were sent to the Spring Boot backend. The emergency request was successfully handled by the backend, which also stored the relevant data in MySQL. This demonstrates that in an emergency, the suggested system can connect the user's mobile device, GPS service, backend server, and database.

C. Live Emergency Monitoring

Following SOS activation, the Live Emergency Active Module effectively maintained the present emergency condition. Authorized monitoring users were given access to the pertinent data, and the emergency record was updated to an active status. This enables guardians to access the available location data and ascertain whether an emergency is ongoing. When the user is unable to manually provide continuous updates, the monitoring system can be very helpful in reducing the reliance on the user continuously conveying their whereabouts during an emergency.

D. Guardian Monitoring

To make sure that only authorized guardians could access classified emergency information, the Guardian Registration and Login Module was tested. Guardians could see the linked user's location and current emergency status after a successful authentication. The outcome shows that between the user and the emergency situation, the guardian component offers an extra layer of emergency support. Additionally, role-based access helps keep important location and emergency data out of the hands of unauthorized individuals.

E. Emergency Volunteer Assistance

By enrolling eligible volunteers and linking their details to specific places, the volunteer aid capability was assessed. The technology analyzes the user's emergency location during an active SOS event and finds volunteers who might be able to help. This feature expands emergency assistance beyond pre-established contacts. The approach may shorten the time needed to locate nearby assistance by taking volunteer availability and geographic proximity into account.

F. Additional Safety Features

The application successfully incorporated the auxiliary safety modules. Information on safety-related incidents can be kept in a dedicated facility called the Evidence Vault. While Nite Safety and Smart Walk offer extra assistance for users during nighttime travel and walking trips, the Safety Heatmap displays geographical information linked to safety. Users can get out of awkward situations by using the Fake Call feature, which simulates calling. Direct communication options with registered emergency contacts are offered by the Calling and SMS modules. Because of these capabilities, the system can be used as a preventive safety-support platform as well as after an incident.

G. Backend and Database Performance

Through REST APIs, the Spring Boot backend effectively managed communication between the mobile application and MySQL database. Application responsibilities were kept apart by the modular architecture's Controller, Service, Repository, Entity, DTO, Configuration, and Exception Handling components. User information, emergency contacts, guardian details, volunteer information, GPS position data, emergency incidents, and safety-related records were all effectively maintained by MySQL. Emergency data may be retrieved and updated as needed thanks to the organized database design.

H. Security Evaluation

The integration of permission and authentication techniques into the backend was verified by security testing. Passwords cannot be directly saved in plain text thanks to BCrypt hashing, and Spring Security only allows authorized and authenticated users to access protected resources. Unauthorized access to sensitive data is lessened

when user, guardian, volunteer, and administrator access are kept apart. These security measures are crucial for preserving user privacy and data protection because the system handles GPS and emergency data.

V. CONCLUSION

A safe and comprehensive platform for personal safety and emergency support is offered by the planned Women Safety Monitoring and Emergency Alert System (SheShield). In order to facilitate user authentication, SOS notifications, GPS location tracking, guardian monitoring, and local volunteer aid, the system integrates Flutter, Java Spring Boot, REST APIs, and MySQL. The whole safety experience is improved by extra features including Evidence Vault, Safety Heatmap, Nite Safety, Smart Walk, Fake Call, Calling, and SMS. Role-based access control, BCrypt password hashing, and Spring Security are used to maintain security. All things considered, SheShield offers a workable and user-friendly solution for women's protection and real-time emergency response, with potential for wearable integration, sophisticated location monitoring, AI-based risk detection, and interaction with official emergency services in the future.

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