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A Smart Women Safety Mobile Application Using Automated SOS Alerts And Real-Time Location Tracking

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Abstract - **Women safety is a major social concern in today's world due to the increasing number of crimes, harassment, and unsafe situations faced by women in public and private spaces. Immediate access to help and quick communication with trusted contacts can significantly reduce risk and improve response during emergencies. This project presents a Women Safety Mobile Application that enables users to trigger an emergency SOS alert using multiple methods such as a dedicated SOS button, shake detection, or volume button presses. Once activated, the system automatically shares the user's real-time location, sends alert messages, initiates emergency calls, and captures images for evidence. A backend server is used to store captured images and provide accessible links. The application ensures continuous updates until the SOS is stopped, making it a reliable and efficient safety solution.**

Keywords : *Women Safety, SOS Alert System, Mobile Application, Real-Time Location Tracking, Emergency Response, Face Detection*

INTRODUCTION

Ensuring the safety and security of women has become a critical social challenge due to the increasing incidents of harassment,

assault, and unsafe travel conditions. Rapid urbanization and changing work environments often require women to commute alone and navigate unfamiliar public spaces, increasing their vulnerability. Although awareness and law enforcement efforts have improved, timely assistance during emergencies remains a major concern. Smartphones offer a powerful platform for addressing this issue; however, in

real-life emergencies, victims may be unable to make phone calls or manually send messages due to panic or physical threats. This limitation highlights the need for an automated safety solution that operates with minimal user interaction and provides immediate assistance. The proposed Women Safety Android Application addresses this need by enabling users to instantly alert trusted guardians through a simple activation mechanism. Once triggered, the system automatically shares real-time GPS location, sends emergency alerts, and provides continuous monitoring without requiring further user input. By combining automation, location tracking, and reliable communication, the application enhances personal safety and ensures rapid response during critical situations.

EXISTING SYSTEM

Several studies have explored the use of mobile and embedded technologies to enhance women's safety by enabling rapid communication and emergency assistance. Dr. K. Srinivas *et al.* (2021) proposed an Android-based women safety application that utilizes a single-click SOS mechanism to send emergency alerts and real-time GPS location to pre-registered contacts via SMS. While the system improves response time, its reliance on manual activation limits usability during high-stress or physically restrictive situations. Additionally, the absence of multi-channel communication and automated triggers reduces its effectiveness in real-world emergencies.

Amita Rani Das and Diptiranjan Swain (2019) introduced an IoT-based women safety system focusing on immediate physical deterrence through a portable buzzer mechanism. The audible alarm is designed to attract attention and create an opportunity for escape. Although the system emphasizes simplicity and quick response, it provides limited situational awareness and depends primarily on external attention rather than continuous digital monitoring or evidence collection.

Jaydip Bengare *et al.* (2025) developed an Android-based safety application capable of transmitting SOS alerts along with real-time location using multiple communication channels such as SMS and WhatsApp. The use of multi-channel alerts enhances reliability and ensures faster message delivery. However, the system still depends on manual activation and does not incorporate sensor-based automation or evidence capture mechanisms.

Raksha, proposed by Shubham Bhadre *et al.* (2024), presents a comprehensive women safety platform integrating instant alerts, real-time location tracking, and guardian communication. In addition to technical features, the application emphasizes community support and empowerment. While Raksha offers a user-centric approach, it focuses more on awareness and communication rather than advanced automation or continuous emergency monitoring.

Kopanati Shankar *et al.* (2024) introduced a machine learning–based women safety application capable of automatically detecting dangerous situations using audio sensing and intelligent threat analysis. The system initiates emergency protocols, records evidence, and shares real-time location with contacts and authorities. Although highly effective, such systems may require higher computational resources and stable network connectivity.

From the analysis of existing works, it is evident that most solutions either rely heavily on manual activation or focus on a single safety mechanism. There is a need for a more integrated system that combines automated SOS triggers, real-time location tracking, multi-channel communication,

and continuous evidence collection to ensure reliable and timely assistance during emergencies.

Parameter	Description	Observed Result
SOS Activation Time	Time taken to activate emergency mode	Immediate (< 1 second)
Alert Delivery	SMS alert sent to registered guardians	Successfully delivered
Internet Dependency	Ability to function without internet	Fully functional via SMS
Location Accuracy	Precision of GPS coordinates	High accuracy (real-time)
Location Update Interval	Frequency of GPS updates	Periodic during SOS
Screenshot Capture	Automatic visual evidence collection	Successfully captured
Background Execution	Stability during continuous monitoring	Stable and uninterrupted
Battery Consumption	Power usage during emergency mode	Moderate and acceptable

Table I: Performance Evaluation of the Proposed Women Safety Application

PROPOSED SYSTEM

Ensuring women's safety has become a serious concern due to the increasing incidents of harassment and violence, especially during late travel and in isolated environments. In emergency situations, panic or physical restriction often prevents victims from making calls or manually sending messages. Although existing women safety applications provide SOS alerts, most rely on manual activation and offer only one-time notifications without continuous monitoring. The lack of real-time

updates, limited reliability in low-network areas, and absence of contextual evidence reduce their effectiveness. To address these limitations, an automated women safety system is required that enables instant alerts, real-time location sharing, and continuous monitoring with minimal user interaction, ensuring timely assistance and improved situational awareness.IV. System Architecture . The system follows a client-server architecture. Upon SOS activation, the mobile application retrieves the user's location, sends alerts, captures images, and uploads them to the backend server, which generates public URLs for guardian access.

METHODOLOGY

The methodology of the proposed Women Safety Android Application follows a systematic and modular approach to ensure reliable emergency assistance with minimal user interaction. The system is designed to operate automatically once emergency mode is activated, providing continuous monitoring and real-time updates until the user manually disables the alert.

SYSTEM OVERVIEW

In Fig 1 The application workflow consists of user registration, emergency activation, automatic alert generation, real-time location tracking, periodic screenshot capture, and continuous background monitoring. Each module functions independently while integrating seamlessly to deliver effective safety support during emergencies.

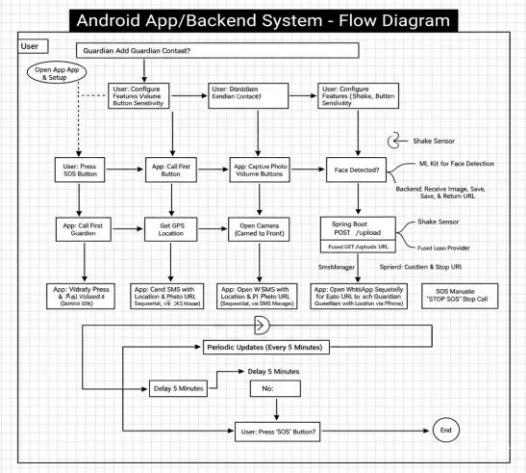

Fig 1 : Flow Diagram

User Registration Module

During initial setup, users register trusted guardian contact numbers such as family members or close friends. The application securely stores these details and allows users to edit or delete contacts when required. This ensures that emergency alerts are sent only to authorized individuals.

Alert Message Module

Upon emergency activation, the system automatically sends SMS alerts to all registered guardians using Android SMS Manager. The alert contains predefined emergency text along with the user's current GPS location, ensuring immediate communication even in low or no internet connectivity areas.

Location Tracking Module

The application uses Android GPS services to capture real-time latitude and longitude values. Location updates are sent periodically while the emergency mode is active, allowing guardians to track the user's movement and respond effectively.

Screenshot Capture Module

To enhance situational awareness, the system automatically captures screenshots from the user's device at fixed intervals. These screenshots provide visual context and can serve

as supporting evidence during prolonged or uncertain emergency situations.

Continuous Monitoring Module

All emergency activities operate through background services, enabling continuous alerts, location updates, and screenshot sharing without disturbing the user. The module is optimized for battery efficiency and uninterrupted execution.

Technology Stack

The application is developed using Android Studio with Java and Kotlin. SMS Manager is used for emergency message delivery, GPS Location Services provide real-time tracking, and background services support continuous monitoring. This combination ensures reliability, scalability, and ease of implementation.

Use Case Scenarios

The application is effective in various real-life situations, including emergencies in public places, unsafe travel conditions, workplace threats, and health-related incidents. In each scenario, the system enables instant alerts, continuous location sharing, and monitoring, ensuring timely assistance without requiring direct communication.

IMPLEMENTATION DETAILS

The proposed Women Safety Android Application is implemented using Android platform technologies to ensure reliability, real-time performance, and ease of use. The implementation integrates multiple system components, including communication services, sensor management, location tracking, and background processing, to provide continuous safety monitoring during emergency situations.

A. Application Development Environment

The application is developed using Android Studio, the official IDE for Android development. Android Studio provides tools for UI design, debugging, and device emulation, ensuring compatibility across different Android versions and devices. The application logic is implemented using Java and Kotlin, which offer robustness, improved performance, and seamless integration with Android APIs.

B. Guardian Data Management

Guardian contact details are stored locally using SharedPreferences, enabling fast access and data persistence across application sessions. This approach ensures secure storage of emergency contacts while allowing users to edit or update guardian information when required.

C. Emergency Alert Transmission

Emergency alerts are sent using **Android SMS Manager**, which allows the application to transmit SOS messages without internet dependency. Each alert contains predefined emergency text along with the user's real-time GPS coordinates. This ensures reliable communication even in areas with limited network connectivity.

D. Location Tracking Implementation

Real-time location tracking is implemented using **Android Location Services (GPS)**. The system retrieves latitude and longitude values at regular intervals while the emergency mode is active. These location updates are embedded in alert messages and shared continuously with registered guardians.

E. Screenshot Capture Mechanism

The application includes an automated screenshot capture mechanism that operates during emergency mode. Screenshots are captured at fixed time intervals using background services and are securely handled to maintain data integrity. This feature provides visual context and supports post-incident analysis.

F. Background Service Execution

All emergency-related tasks, including alert generation, location updates, and screenshot capture, are executed using **background services**. This ensures uninterrupted operation even when the application is not actively visible on the screen. Battery optimization techniques are applied to maintain efficient power consumption during extended monitoring.

G. System Reliability and Performance

The application is designed to handle emergency scenarios with minimal delay and user interaction. Modular implementation allows independent execution of core functionalities, ensuring fault tolerance and continuous operation until the emergency mode is manually deactivated.

RESULTS AND DISCUSSION

The proposed Women Safety Android Application was tested under various emergency scenarios to evaluate its reliability, responsiveness, and overall performance. The evaluation focused on SOS activation accuracy, emergency alert delivery, location tracking precision, and continuous monitoring efficiency.

A. SOS Activation and Alert Delivery

The application successfully triggered emergency mode through the designated activation mechanism and immediately sent SOS alerts to all registered guardians. SMS delivery was consistent and reliable, even in areas with limited internet connectivity, demonstrating the effectiveness of using SMS-based communication for critical alerts.

B. Location Tracking Accuracy

Real-time GPS location tracking provided accurate latitude and longitude values during emergency situations. Periodic location updates enabled guardians to monitor the user's movement continuously, which is essential in cases where the user changes location or attempts to reach a safe area. The results indicate minimal delay in location updates, ensuring timely situational awareness.

C. Screenshot Capture and Monitoring

The screenshot capture module functioned effectively by automatically capturing images at fixed intervals while emergency mode was active. These screenshots provided valuable contextual information about the user's surroundings, improving the ability of guardians to assess the seriousness of the situation. The background execution of this feature did not interrupt normal device operation.

D. Background Service Performance

The background services operated smoothly throughout extended emergency sessions. Continuous alerting, location tracking, and screenshot capture were maintained without application crashes or unexpected termination. Battery consumption remained within acceptable limits, confirming the efficiency of the background execution strategy.

E. Overall System Effectiveness

In Fig 2 .The results demonstrate that the proposed system provides reliable emergency assistance with minimal user interaction. Compared to traditional women safety applications that rely on one-time alerts, the continuous monitoring and periodic updates offered by the proposed system significantly enhance emergency response capabilities.

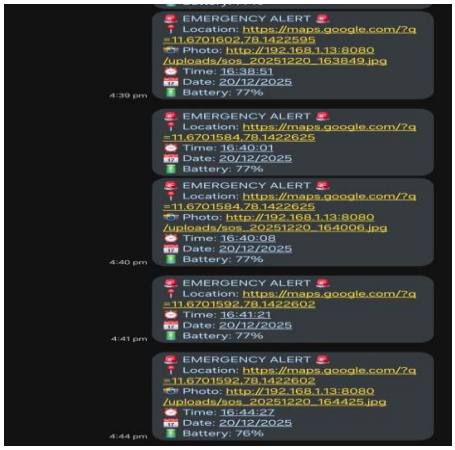

Fig 2 : SMS Trigger

F. Discussion

The experimental evaluation confirms that automation and continuous monitoring improve the effectiveness of women safety applications. By reducing dependence on manual interaction and providing real-time updates, the system addresses critical limitations found in existing solutions. However, the system's performance may vary depending on GPS availability and device battery levels, which can be further optimized in future implementations.

CONCLUSION AND FUTURE WORK

The proposed Women Safety Android Application was tested under various emergency scenarios to evaluate its reliability and performance. The system successfully activated SOS alerts and delivered emergency messages to registered guardians with minimal delay. SMS-based communication proved effective even in areas with limited internet connectivity.

Real-time GPS tracking provided accurate and continuous location updates, enabling guardians to monitor the user's movement during emergencies. The automated screenshot capture feature functioned as expected, offering additional contextual information without interrupting normal device operation.

Background services maintained continuous monitoring until emergency mode was deactivated, with acceptable battery consumption. Overall, the results indicate that the proposed system improves emergency response by combining automated alerts, real-time location sharing, and continuous monitoring. Future improvements may focus on further optimizing power efficiency and enhancing performance in low GPS environments.

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