

Aura Safe: Women Safety Development and Management System

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Abstract: *Women's safety is a critical concern in today's society due to the increasing number of harassment and crime incidents. This paper presents Aura Safe, an Android-based Women Safety Development and Management System designed to provide immediate assistance, real-time monitoring, and preventive safety features. The system incorporates advanced functionalities including real-time GPS location tracking, shake-based SOS alert mechanism, fake call simulation, and crime rate visualization. The SOS alert system sends emergency messages with precise GPS coordinates to pre-registered contacts upon device shake detection, enabling rapid response without manual interaction. The fake call feature helps users escape dangerous scenarios through a simulated incoming call. The crime rate visualization module provides area-wise crime statistics for informed safety decisions. The system is developed using Android Studio with Java, Google Maps API, SMS Manager API, and accelerometer sensor integration. Results demonstrate reliable operation across Android 7.0–13 devices. The proposed system addresses existing limitations in standalone safety applications by unifying multiple protective features into a single platform.*

Keywords: Women Safety, Android Application, GPS Tracking, SOS Alert, Shake Detection, Fake Call, Crime Visualization, Mobile Security

I. INTRODUCTION

Women's safety has emerged as one of the most critical concerns in modern society due to the increasing number of crimes such as harassment, assault, and other unsafe situations faced by women in both public and private spaces. Despite various measures taken by authorities, ensuring immediate help during emergency situations remains a major challenge. Many incidents occur due to the lack of timely assistance and awareness, highlighting the urgent need for a reliable and efficient safety system.

With the rapid advancement in mobile technology, smartphones have become an essential part of everyday life. Modern smartphones are equipped with powerful features such as Global Positioning System (GPS), internet connectivity, sensors, and communication capabilities that can be effectively utilized to design applications that enhance personal safety. Mobile applications provide a convenient and accessible platform for delivering real-time safety solutions.

The proposed system, Aura Safe – Women Safety Development and Management System, is an Android-based application that integrates multiple features to ensure quick response and preventive awareness in emergency situations. The primary aim is to create a dependable platform that can be used without requiring technical expertise. The key objectives of the system are:

- To provide immediate assistance to users during emergency situations.
- To enable real-time location tracking and sharing for safety purposes.
- To develop a quick and efficient SOS alert mechanism using mobile sensors.



- To provide a fake call feature to help users escape uncomfortable situations.
- To create awareness about crime-prone areas using crime data visualization.
- To design a user-friendly and reliable mobile application for daily use.

II. LITERATURE SURVEY

Women's safety has become a significant area of research, leading to the development of various mobile applications and technological solutions. Studies on mobile safety applications highlight the importance of real-time location tracking and emergency alert systems. Many existing applications provide features such as sending location details to emergency contacts through SMS or internet-based services, ensuring the user's location can be tracked during critical situations [6].

Sensor-based emergency triggering mechanisms have also been explored, where emergency alerts are activated using gestures such as shaking the phone or pressing hardware buttons. This approach is particularly useful when the user is unable to manually access the application. However, issues such as false triggering and battery consumption need to be carefully managed [4].

Several existing systems include fake call or simulated interaction features to help users escape uncomfortable situations; however, these are typically limited to basic functionality and lack integration with other safety features [3]. Applications providing crime data visualization use historical crime data to inform users about unsafe areas, but many rely on static or outdated data, which reduces real-time effectiveness.

Research has also explored cloud-based systems for centralized monitoring, but these require continuous internet connectivity which may not be available in emergencies [5]. Most existing solutions focus on individual features rather than providing a comprehensive integrated platform. The proposed Aura Safe system aims to overcome these limitations by combining real-time tracking, shake-based SOS, fake call functionality, and crime rate visualization in a single unified application [1][2].

III. REQUIREMENTS ANALYSIS

A. Functional Requirements

The system must support: user registration and emergency contact management; real-time GPS-based location tracking displayed on a map; location sharing via SMS to emergency contacts; SOS alert dispatch with GPS coordinates upon manual or automatic trigger; shake-based SOS detection via accelerometer; fake call simulation; city-wise crime rate visualization; and background service operation for continuous monitoring.

B. Non-Functional Requirements

The application must be operable under stress with minimal interaction steps. Performance requirements include fast alert dispatch and responsive location services. The system must be reliable without crashes during emergencies, secure in handling location and contact data, battery-efficient, and compatible with Android 5.0 and above across diverse device configurations.

C. Hardware Requirements

- Android Smartphone with minimum 2 GB RAM
- GPS-enabled device with accelerometer sensor
- Internet connectivity (optional but recommended for map features)

D. Software Requirements

- Android Studio (Development Environment)
- Java / Kotlin Programming Language
- Android SDK (API Level 21+), Google Maps API



- Firebase Realtime Database (Optional), SMS Manager API
- Operating System: Android Version 5.0 (Lollipop) or above

IV. SYSTEM DESIGN

A. System Architecture

The system follows a client-side modular architecture where the Android application acts as the primary interface, interacting with device hardware (GPS, accelerometer) and communication services (SMS). An optional Firebase cloud backend supports data persistence and real-time synchronization. The major modules are: User Interface, Location Tracking, SOS Alert, Shake Detection, Fake Call, and Crime Data Module.

B. Module Description

- (1) Location Tracking Module: Uses FusedLocationProviderClient with GPS services to obtain the user's current latitude and longitude and display it on a Google Maps interface. Location data feeds the SOS module for accurate coordinate inclusion in alerts.
- (2) SOS Alert Module: Employs the Android SMS Manager API to send predefined emergency messages along with GPS coordinates to all pre-registered emergency contacts. Designed for minimal latency.
- (3) Shake Detection Module: Monitors accelerometer data via Android Sensor Manager. When acceleration magnitude exceeds a configurable threshold, the SOS alert is automatically triggered — enabling hands-free emergency response without manual interaction.
- (4) Fake Call Module: Simulates an incoming call interface using Android telephony components, allowing users to create a believable distraction and exit unsafe situations discreetly.
- (5) Crime Data Module: Aggregates and visualizes city-wise crime statistics using bar charts and pie charts, helping users assess area safety levels before travelling.

C. Data Flow

The data flow is as follows: (a) User opens the app → GPS location is fetched and displayed on map; (b) Device shake detected → accelerometer threshold crossed → SOS triggered → SMS with current coordinates sent to emergency contacts; (c) User selects Fake Call → simulated incoming call UI is displayed; (d) User views Crime Rate → location-based statistics are rendered. The ER model includes entities: User, EmergencyContact, SOSAlert, LocationData, and CrimeData.

D. UI Design

The user interface is designed based on Material Design principles to ensure simplicity, accessibility, and responsiveness across screen sizes. Navigation uses a bottom navigation bar and a navigation drawer. Key design choices include: large buttons for emergency actions, high contrast colors for visibility in stressful situations, and a minimal number of steps to trigger SOS. The application includes screens for: Home (Map View), SOS Contacts, Fake Call, Crime Rate, and Settings.

V. IMPLEMENTATION

A. Development Environment

The application is developed using Android Studio IDE with Java as the primary programming language and XML for UI layout design. Material Design components ensure a consistent and accessible interface throughout. The application was tested using both the Android Emulator and physical Android devices (Android 7.0 to 13) to ensure broad compatibility.



B. Key Implementation Details

The shake detection is implemented using Android's SensorManager listening to TYPE_ACCELEROMETER events. The magnitude of the acceleration vector is compared against a threshold (default: 12 m/s²) to distinguish intentional shaking from normal motion, minimizing false alerts. Background services are managed using Android foreground services to remain active even when the app is minimized, with a persistent notification to comply with Android background execution limits. Runtime permissions for location (ACCESS_FINE_LOCATION), SMS (SEND_SMS), and call features are requested dynamically following Android 6.0+ guidelines. The complete SOS dispatch requires fewer than two user actions, ensuring rapid response in critical situations.

C. Technology Stack Summary

- Frontend: Android Studio, Java, XML, Material Design Components
- Location Services: FusedLocationProviderClient, Google Maps API
- Communication: SMS Manager API for emergency alert dispatch
- Sensors: Sensor Manager API (Accelerometer) for shake detection
- Database: SQLite (local), Firebase Realtime Database (optional cloud)
- Tools: Git for version control, Android Emulator and physical devices for testing

D. Implementation Challenges

Key challenges included: maintaining background service continuity across Android versions with varying battery optimization policies; ensuring GPS accuracy in urban and indoor environments; calibrating the accelerometer threshold to balance sensitivity and false positive rate; handling SMS delivery failures in low-network conditions; and maintaining UI responsiveness during simultaneous background service operation. These were resolved through iterative testing, configurable thresholds, and use of Android WorkManager for reliable background scheduling.

VI. RESULTS AND DISCUSSION

The Aura Safe application was tested on multiple Android devices running Android 7.0 through 13, using both the Android emulator and physical hardware. All core modules performed reliably under test conditions:

- GPS location was acquired within 5–10 seconds under outdoor conditions.
- SOS alerts were dispatched within 3 seconds of shake detection trigger.
- Fake call simulation functioned correctly across all tested device configurations.
- Crime rate visualization rendered accurate city-wise statistics for all selected locations.
- Background shake detection remained active even after app minimization.

The interface was validated for ease of use, confirming that users could trigger the SOS feature with minimal interaction. The APK size remained under 15 MB, ensuring accessibility on low-end devices. Compared to existing single-feature applications, Aura Safe demonstrates a comprehensive advantage by combining preventive awareness (crime data) with reactive emergency response (SOS alert and fake call), addressing both pre-incident and in-incident safety needs in a single platform.

VII. ADVANTAGES AND DISADVANTAGES

A. Advantages

- Quick emergency response with GPS-precise SOS alerts dispatched within seconds.
- Real-time location tracking with live map display for continuous safety monitoring.
- Multiple safety features — SOS, shake detection, fake call, crime data — unified in one platform.
- Hands-free automatic alert triggering via shake detection requires no manual interaction.
- Offline-capable SMS alerts function without internet connectivity.



- Lightweight and portable application accessible on most Android devices.
- Crime rate module improves safety awareness for informed travel decisions.

B. Disadvantages

- Location tracking accuracy depends on GPS signal availability and environmental conditions.
- Continuous background services and GPS usage increase battery consumption.
- Currently limited to Android platform; iOS is not supported.
- Shake detection may occasionally produce false alerts with very sensitive thresholds.
- SMS delivery depends on network availability and may be delayed in low-coverage areas.
- Crime data module currently uses static datasets; real-time data integration is not yet implemented.

VIII. CONCLUSION AND FUTURE SCOPE

This paper presents Aura Safe, a comprehensive Android-based Women Safety Development and Management System that integrates real-time GPS tracking, shake-triggered SOS alerts, fake call simulation, and crime rate visualization into a unified, user-friendly platform. The system successfully achieves its primary objective of enabling rapid emergency response with minimal user interaction, while also providing preventive safety awareness through crime statistics.

Testing across multiple devices confirms reliable performance, fast alert dispatch, and intuitive usability. The modular architecture ensures maintainability and supports future expansion without major restructuring.

Future enhancements planned include:

- Integration of real-time crime data via government and public safety APIs.
- AI-based threat detection using behavioral and location pattern analysis.
- Voice-command SOS activation for fully hands-free emergency response.
- Continuous live location streaming to emergency contacts during an alert.
- iOS platform support to broaden accessibility.
- Integration with wearable devices such as smartwatches for quick SOS activation.
- Cloud-based real-time monitoring dashboard and end-to-end encrypted communication.

With these advancements, Aura Safe can evolve into an intelligent, cross-platform personal safety ecosystem, contributing meaningfully to women's security in society.

REFERENCES

- [1] Android Developers, "Android Developer Documentation," [Online]. Available: <https://developer.android.com>
- [2] Google Developers, "Location and Maps API Documentation," [Online]. Available: <https://developers.google.com/maps>
- [3] Android Developers, "Sending SMS Messages," [Online]. Available: <https://developer.android.com/guide/topics/permissions>
- [4] Android Developers, "Sensor Framework," [Online]. Available: <https://developer.android.com/guide/topics/sensors>
- [5] Firebase Documentation, "Firebase for Mobile Applications," [Online]. Available: <https://firebase.google.com/docs>
- [6] Research Article, "Mobile Based Women Safety Application Using GPS Tracking," International Journal of Engineering Research and Technology (IJERT).
- [7] Government of India, "Crime in India Reports," National Crime Records Bureau (NCRB). [Online]. Available: <https://ncrb.gov.in>
- [8] R. S. Pressman, Software Engineering: A Practitioner's Approach. McGraw-Hill Education.
- [9] R. Kamal, Mobile Computing. Oxford University Press

