International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

RAKSHA - Women Safety & Emergency Response System

Ms. Sushmita Das
Department Of Computer Engineering Universal College Of Engineering Vasai, Maharashtra

Ms. Vaishnavi Bhagat
Department Of Computer Engineering Universal College Of Engineering Vasai, Maharashtra

Mr. Adil Ansari
Department Of Computer Engineering Universal College Of Engineering Vasai, Maharashtra

Ms. Aditi Dhekane
Department Of Computer Engineering Universal College Of Engineering Vasai, Maharashtra

Ms. Nehali Mhatre
Department Of Computer Engineering Universal College Of Engineering Vasai, Maharashtra

Abstract - **The increasing need for enhanced personal security has led to the development of technology-driven safety solutions for women. This paper presents *Raksha*, a smart mobile application designed to provide immediate assistance during emergency situations. The proposed system integrates key functionalities such as one-touch emergency activation, real-time location tracking, and automated notifications to predefined contacts.**

The design emphasizes rapid response and ease of use, enabling users to request help with minimal interaction during critical conditions. By leveraging smartphone capabilities, the application ensures continuous communication and improves response effectiveness. The system is also developed to remain accessible to users with varying levels of technical knowledge.

The implementation demonstrates that Raksha can function as an effective tool for improving personal safety by minimizing delays and increasing situational awareness. This study highlights the role of mobile technology in supporting safer environments and enhancing user confidence.

***Keywords* - Women safety, emergency alert system, mobile application, real-time location tracking, personal security, smart safety system**

I. INTRODUCTION

The issue of personal safety has gained increasing attention due to the persistent risks faced by women in both public and private environments. Despite the availability of helplines and law enforcement support, a major challenge lies in the delay between the occurrence of an emergency and the arrival of assistance. This time gap often determines the severity of the outcome, making immediate response mechanisms critically important.

Traditional safety measures rely heavily on manual reporting or external intervention, which may not always be feasible in high-risk situations. Furthermore, in moments of distress, individuals may not be able to communicate effectively or navigate complex systems to seek help. This highlights the need for solutions that require minimal effort while ensuring rapid communication.

The advancement of mobile technology offers a practical foundation for addressing these challenges. Smartphones, being widely accessible, can serve as personal safety tools if designed with efficiency and reliability in mind. However, existing applications often lack simplicity, consistency, or fail to function effectively under real-world constraints.

II. REVIEW OF LITERATURE

Over the years, numerous mobile-based solutions have been proposed to address concerns related to personal safety, particularly for women, with each approach attempting to improve response time and accessibility during emergencies. Early systems were largely centered around basic functionalities such as emergency calling and text-based alerts, which provided a foundational level of support but relied heavily on user interaction. As smartphone technology advanced, developers began integrating location-based services, enabling real-time tracking and better situational awareness for emergency contacts. This development significantly improved the effectiveness of such applications; however, it also introduced challenges related to network dependency and battery consumption. More recent approaches have focused on minimizing user effort by incorporating alternative triggering mechanisms, including gesture recognition, shortcut activation, and background processes that allow the system to function without constant manual input. While these enhancements

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

contribute to faster response and improved usability, they also present issues such as unintended activation and inconsistent performance across devices. Additionally, existing studies emphasize that overly complex interfaces can reduce effectiveness during high-stress situations, highlighting the importance of simplicity and intuitive design. Despite ongoing improvements, many current solutions struggle to achieve a balance between reliability, efficiency, and ease of use, indicating the need for more practical and user-centered safety systems.

A. LITERATURE REVIEW

The development of mobile-based safety systems has gained attention as a response to increasing concerns regarding personal security. Initial solutions primarily focused on enabling users to contact emergency services through basic mechanisms such as phone calls and text message and hardware devices[1],[5]. These systems provided a starting point for digital safety but required manual effort, which could be difficult during high-stress situations. Over time, the need for faster and more efficient communication led to the integration of automated alert systems. In addition to alerting personal contacts, highly integrated systems have been developed to communicate directly with law enforcement, utilizing stealthy triggers like rapid device shaking to transmit GPS coordinates directly to custom map interfaces at local police stations[4],[8].However, the absence of contextual data, such as location or environmental conditions, limited their overall effectiveness. As a result, researchers began exploring more advanced approaches that could deliver both speed and relevant information in emergency scenarios .While several existing applications rely on pressing the device's power button multiple times to activate the SOS, this approach has been criticized as ergonomically inconvenient and difficult to execute swiftly during high-stress situations[4].Many applications and IoT- based systems are designed to operate continuously or rely on continuous biometric sensor processing[9]. While this approach enhances automated reliability, it can significantly impact device performance in terms of battery consumption and memory usage.In areas with weak or unstable networks, the performance of such systems often declined. To address this issue, some applications incorporated hybrid communication methods, combining internet-based services with SMS functionality via GSM modules[10],[12]. While this improved reliability, it also created trade-offs in terms of data accuracy and update frequency, highlighting the complexity of designing universally effective safety systems.

Recent developments have focused on reducing the level of user interaction required to activate emergency features. Instead of relying solely on manual input, modern applications have introduced alternative triggering mechanisms such as gesture detectionby introducing alternative triggering mechanisms such as gesture detection, shake sensors, and voice activation [5],[10].hardware button combinations, and quick-access shortcuts. These innovations aim to ensure that users can request assistance even when they are unable to interact with the device in a conventional manner. Although these features improve accessibility, they also introduce challenges related to activation. False alerts can reduce the credibility of the system and may lead to unnecessary panic among recipients. Therefore, achieving a balance between responsiveness and accuracy remains a critical consideration in the design of such applications.

To ensure perpetrators cannot tamper with evidence, modern applications capture short video clips of the incident and instantly upload them to secure cloud databases like Firebase, providing authorities with direct links to the immutable footage[2],[3].This approach enhances reliability but can impact device performance, particularly in terms of battery consumption and memory usage. Developers must carefully optimize these systems to minimize resource usage while maintaining functionality. In addition, differences in hardware and operating systems can lead to inconsistent behavior across devices, making it challenging to deliver a uniform user experience. These technical constraints highlight the need for adaptable and efficient system design strategies.

Comprehensive emergency response systems can be further augmented by integrating offline resources such as first-aid guidelines and direct links to toll-free medical helplines, providing holistic support and medical assistance during crises[5],[6].Research indicates that systems with simple and intuitive designs are more likely to be used effectively under stress. Features such as one-touch activation, clear visual indicators, and minimal navigation steps can significantly improve response time. On the other hand, applications that include excessive features or complicated workflows may hinder usability, reducing their practical value. This has led to a growing emphasis on user-centered design principles in the development of safety solutions.

Despite the progress achieved in this domain, several limitations remain in existing approaches. Many systems either prioritize functionality at the cost of simplicity or focus on ease of use while compromising reliability. Additionally, factors such as network dependency, device compatibility, and unintended activation continue to affect performance in real-world scenarios. These challenges indicate that there is still a need for more balanced solutions that can effectively combine accessibility, responsiveness, and dependability.

III. OBJECTIVES

The primary objectives of implementing *Raksha*, a smart women safety application, are:

- To provide a rapid and reliable mechanism for users to request help during emergency situations with minimal interaction.

- To enable real-time location sharing with trusted contacts, ensuring accurate tracking and timely assistance.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

• To design an intuitive and user-friendly interface that can be easily operated under stress without requiring technical expertise.

• To integrate automated alert systems that notify predefined contacts instantly upon activation.

• To ensure consistent performance across varying network conditions by incorporating dependable communication methods.

• To minimize response time by optimizing system efficiency and reducing delays in alert transmission.

• To develop a secure platform that protects user data and maintains privacy while sharing critical information.

• To create a scalable and flexible architecture that supports future enhancements and additional safety features without affecting existing functionality.

IV. METHODOLOGY

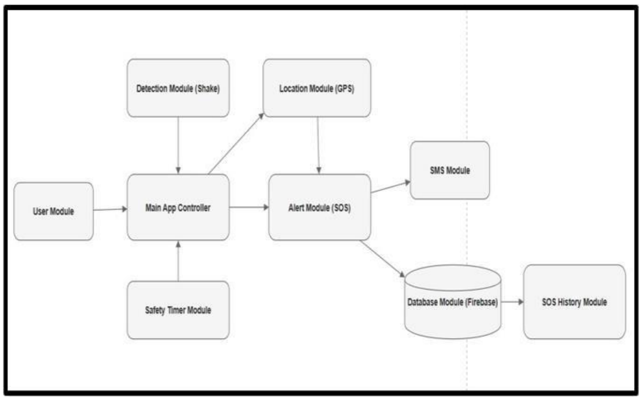
The next stage involves real-time location acquisition using the device's GPS services. The application continuously captures the user's coordinates and prepares them for transmission. This information is then shared with predefined emergency contacts through available communication channels such as internet-based services or SMS, depending on network availability.

Simultaneously, an alert message is generated and sent automatically to selected contacts. The message includes essential details such as the user's identity and location link, enabling recipients to respond promptly. The system is designed to ensure that alerts are delivered with minimal delay, even under unstable network conditions.

A. System Architecture

To prevent attackers from tampering with the device or disabling the emergency alert, advanced safety applications incorporate locking mechanisms that require a custom PIN to halt audio and video recordings once the SOS is triggered[1],[2].

FIGURE 1



1. User Layer

The User layer represents the individual operating the application during normal and emergency conditions. The user interacts with the system through actions such as triggering an alert or initiating location sharing. In critical situations, the user activates the emergency feature using an emergency button or gesture-based input. These actions serve as the starting point of the system workflow, initiating further processing. The user also indirectly interacts with other components such as receiving confirmations or system feedback. This layer is designed to require minimal effort, ensuring that the user can operate the application quickly and efficiently under stress conditions.

2. User Interface Module:

The User Interface Module acts as the interaction layer between the user and the system. It includes components such as the emergency button and gesture detection mechanisms. This module captures user input and translates it into system commands. It is designed with simplicity and accessibility in mind, allowing users to activate emergency features without navigating complex menus. The interface ensures that critical functions are easily reachable and can be executed with a single action. Once input is received, the module forwards the request to other system components for further processing.

3. GPS Location module

This module is optimized to balance accuracy and resource consumption, ensuring efficient operations.To overcome the lag and bugs associated with static GPS updates, continuous location streaming can be implemented using real-time databases and data-stream networks, allowing emergency contacts to dynamically track the user's movements on a live map[9],[10],[12].

4. Alert Processing Module:

The Alert Processing Module handles the generation of emergency alerts. Once triggered, it processes the input received status and location link. This module ensures that the alert is formatted correctly and is ready for transmission. It acts as the decision-making unit that prepares all necessary details before forwarding them to the communication system.

5. Communication Module:

The Communication Module is responsible for transmitting alerts to predefined emergency contacts. It supports multiple communication channels, including SMS notifications and internet-based messaging. This dual approach ensures that alerts can be delivered even in conditions where internet connectivity is unstable. The module receives processed data from the alert processing

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

unit and distributes it to recipients without delay. It plays a critical role in ensuring reliability, speed, and successful delivery of emergency notifications.

6. Emergency Contacts Layer:

The Emergency Contacts layer includes individuals or services such as family members, friends, or helpline authorities. These recipients receive alert messages along with the user's location information. This layer represents the endpoint of the communication process, where action can be taken based on the received alert. The effectiveness of the system depends on the timely delivery of information to this layer.

7. Data and Privacy Module:

Because personal location data and emergency alerts are highly sensitive, it is critical to secure the data transmission process using cryptographic methods such as the Advanced Encryption Standard (AES)[14].This module maintains confidentiality and prevents unauthorized access to user information. It operates alongside other modules to ensure that safety does not compromise privacy.

8. Monitoring and Logs Module:

The Monitoring and Logs Module maintains records of system activities, including alert triggers and communication events. These logs help in analyzing system performance and identifying potential issues. It also supports transparency and accountability by keeping track of operations. This module is useful for future improvements and debugging purposes.

9. Feedback and Optimization Module:

The Feedback and Optimization Module is responsible for improving overall system performance. It analyzes operational data and system behavior to identify areas for enhancement. Based on this analysis, optimizations are applied to improve efficiency, reduce delays, and ensure consistent functionality.

B. System Requirements

a. Hardware Requirements.

• Smartphone device (Android-based).
• Quad-core processor (1.4 GHz or higher recommended).
• Minimum 2 GB RAM (4 GB recommended for smooth performance).
• Storage space of at least 100–200 MB for application installation.
• GPS-enabled device for accurate location tracking.
• Internet connectivity (Wi-Fi or mobile data).
• SIM card support for SMS functionality.
• Accelerometer sensor for shake detection feature.
• Touchscreen display for user interaction.

b. Software Requirements

• Operating System: Android OS (version 8.0 or above).
• Development Environment: Android Studio.
• Programming Language: Java / Kotlin.
• APIs: Google Maps API (for location services).
• Database: Firebase / SQLite.
• Internet Services: REST APIs for communication.
• SMS Gateway (for offline alert support).

c. Functional Requirements

• User should be able to trigger an emergency alert instantly
• System must capture and share real-time location
• Application should send notifications to predefined contacts
• System must operate with minimal user interaction.
• Alerts should be delivered through multiple communication channels.
• Application should maintain user data securely.

V. RESULTS AND DISCUSSION

A. User Interface Description (Login Screen)

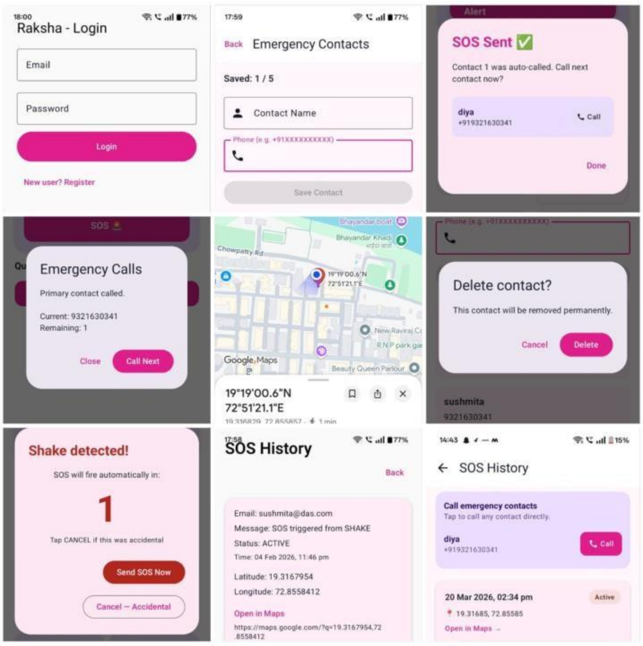
The presented interface represents the login module of the *Raksha* mobile application, designed to provide secure and straightforward user authentication. The screen follows a minimalistic layout to ensure ease of use and quick interaction. At the top, the application title *"Raksha - Login"* clearly identifies the purpose of the interface.

The interface includes two primary input fields: Email and Password, which allow users to enter their registered credentials. These input fields are designed with clear placeholders and sufficient spacing to enhance readability and reduce input errors. The password field ensures secure entry by masking sensitive information.

B. SOS History Interface Description

The system allows users to directly interact with stored records through features such as "Open in Maps", which redirects to external mapping services for location visualization, and "Mark as Resolved", which updates the status of an alert after the situation is handled. Additionally, the interface includes quick access to emergency contact calling, enabling users to initiate calls directly from the history screen. This module enhances situational tracking and provides users with a clear record of past emergency activities for reference and analysis.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026



C. Trigger Detection Interface Description

The interface provides two clear actions: “Send SOS Now” for immediate alert transmission and “Cancel – Accidental” to abort the process. The countdown timer visually communicates the remaining time before automatic activation. This module integrates sensor-based detection with user confirmation to balance responsiveness and reliability in emergency scenarios.

D. Detailed SOS Record Interface Description

The Detailed SOS Record screen presents comprehensive information related to a specific emergency event. It includes fields such as user email, trigger source (e.g., shake or manual activation), status, timestamp, and precise geographical coordinates (latitude and longitude).

E. Emergency SOS and Calling Interface Description

A pop-up dialog displays real-time call status, including the current contact being called and the number of remaining contacts, ensuring user awareness during the process. Options such as “Call Next” and “Close” provide control over the calling sequence. This module integrates alert transmission with voice communication, ensuring multiple layers of emergency response.

TABLE 1
Performance Analysis Table

SOS Response Time	Time taken to trigger all actions after SOS	< 2 seconds
Alert Message Delivery	Successful delivery of SMS alerts	96–99% accuracy
Emergency Call Initiation	Automatic call to emergency services	Successful
GPS Location Accuracy	Average location error during SOS events	4–6 meters
Network Dependency	Performance (low network)	Moderate impact

The performance analysis table presents the evaluation of the *Women Safety* application across key functional parameters. The results indicate that the system responds quickly to SOS activation, with all emergency actions triggered in less than two seconds. Alert messages are delivered with high reliability, achieving an accuracy of 96–99%. Emergency call initiation is consistently successful, ensuring immediate contact with emergency services. The GPS module provides location accuracy within a range of 4–6 meters, which is sufficient for real-time tracking. Although network conditions have a moderate impact on performance, the system continues to function effectively.

VI. CONCLUSION

This paper presented Raksha, a mobile-based safety application designed to provide immediate assistance during emergency situations through an efficient and user-centric approach. The system integrates functionalities such as rapid alert triggering, real-time location sharing, and reliable communication mechanisms to support timely response. The modular architecture of Raksha enables stable performance, scalability, and consistent operation across different devices and conditions.

VII. FUTURE SCOPE

The Raksha application, in its current form, establishes a reliable and efficient foundation for women's emergency response. However, several enhancements can be incorporated in future iterations to further strengthen its capabilities and broaden its impact.

One significant area of improvement involves the integration of artificial intelligence and machine learning techniques to enable proactive threat detection. By

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 03 , March - 2026

analyzing patterns in device motion, location history, and user behavior, the system could autonomously identify potentially dangerous situations and trigger alerts without requiring any manual input from the user.

Voice-command based SOS activation represents another planned enhancement. Allowing users to trigger emergency alerts through a predefined keyword or phrase would make the system accessible even when physical interaction with the device is not possible, addressing a critical limitation of button and shake-based triggers in high-stress scenarios.

Integration with wearable devices such as smartwatches is also envisioned. Continuous monitoring of biometric parameters including heart rate and motion patterns through a paired wearable would enable passive, automatic alert triggering based on physiological anomalies, providing an additional layer of protection.

Future versions also aim to establish direct communication channels with local law enforcement agencies, enabling real- time alert transmission to the nearest police station alongside personal emergency contacts. This would significantly reduce response time in critical situations.

Additionally, expanding multilingual interface support will improve accessibility for users across diverse linguistic backgrounds, ensuring the application can be adopted widely across different regions of India and beyond. Offline functionality enhancements, including SMS-based fallback mechanisms for areas with poor internet connectivity, will also be prioritized to ensure reliable performance under all network conditions.

VIII. REFERENCES

[1] M. Maind, C. Jalgi, M. Jadhav and G. Maniyar, "Women Safety Device with GPS Tracking and SMS Alerts," International Journal of Engineering & Science Research (IJRASET), 2025.

[2] K. Sinha et al., "Women Security Application Using Smart Emergency Response System and Real-Time Location Tracking," International Scientific Journal of Engineering and Management (ISJEM), 2025.

[3] S. Khartad, P. Thorat and S. Gunjal, "Emergency Alert & Tracking Device for Women Safety," International Journal of Research Publication and Reviews (IJRPR), 2024.

[4] S. Jayapratha, C. Subashini and R. Vaishnavi, "Creating Application on Android for Women’s Safety," International Journal of Engineering Research & Technology (IJERT), 2024.

[5] H. J, P. N, S. N and P. J, "Women Safety System Using IoT," International Journal of Engineering Research & Technology (IJERT), 2023.

[6] H. A. Chavan et al., "Women Safety Application," International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), 2022.

[7] Gurram and N. Giri, "Improving Localization Accuracy of Android’s Fused Location Provider API Using Kalman Filter," 2016 International Conference on Computer Communication and Informatics (ICCCI), 2016.

[8] R. K. Megalingam, R. Nair and S. M. Prakhya, "Wireless Vehicular Accident Detection and Reporting System," 2010 International Conference on Mechanical and Electrical Technology, Singapore, 2010,

pp. 636-640.

[9] S. K. Subramanian, S. K. Venkatesan and R. Narayanan, "SmartphoneBased Emergency Alert System for Women Safety Using GPS and GSM," International Journal of Advanced Computer Science and Applications (IJACSA), vol. 9, no. 3, pp. 45-50.

[10] P. S. Nandhini and S. Radha, "IoT Based Smart Security System for Women Safety," 2017 International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2017, pp. 122-126.

[11] S. Prashanth, G. Patel, and B. Bharathi, "Research and Development of a Mobile Based Women Safety Application with Real-Time Database and Data-Stream Network," 2017 International Conference on Circuits Power and Computing Technologies (ICCPCT), Kollam, India, 2017, pp. 1–6.

[12] S. K. Sharma and P. Ranjana, "Women Safety-Saviour Android Application," 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 2022, pp. 1552–1556.

[13] Chand, S. Nayak, K. S. Bhat, S. Parikh, Y. Singh, and A. A. Kamath, "A Mobile Application for Women's Safety: WoSApp," 2015 IEEE Region 10 Conference (TENCON), Macao, China, 2015, pp. 1–5.

[14] V. Agarwal, V. Singh, A. Kamboj, A. Sirohi, and A. Mehto, "Development of A Women Safety Smartphone Application- SAKHI," 2023 Third International Conference on Secure Cyber Computing and Communication (ICSCCC), Jalandhar, India, 2023, pp. 212–217.