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Raksha - Women Safety App

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***Abstract*—Women's safety remains a critical social concern in modern society, demanding innovative technological interventions to ensure protection and empowerment. This project proposes a Women Safety Web Application that leverages real-time technologies, geolocation services, and AI assistance to enhance personal security and confidence in both public and private spaces. The proposed system integrates multiple proactive and reactive safety features such as emergency SOS alerts, geofencing notifications, spycam detection, and secure place marking, ensuring timely response and situational awareness. In emergencies, the system automatically shares live location, audio/video evidence, and vehicle details with trusted contacts and authorities. Additionally, features like Travel Buddy, Fake Call simulation, and Taxi Safety ensure women can navigate safely and independently.Beyond safety, the application includes community forums, legal aid chatbots, and NGO connectivity, fostering a supportive ecosystem for women's mental, legal, and social well-being. The platform is developed using React (frontend), Node.js (backend), and MongoDB (database), integrated with AI-based chatbots and real-time alert systems for effective communication and monitoring.**

***Index Terms*—Women Safety Application, Android App, GPS Location Tracking, SOS Emergency Alert, Real-Time Location Sharing, SMS Alert System, Firebase, Mobile Security, Emergency Response System, Personal Safety Technology**

I. Introduction

In the recent past, the concept of personal safety has been a pressing concern globally, and the concern has been focused on the safety and security of women. Despite the growth in education, awareness, and law and order, the rate of occurrence of crimes such as harassment, assault, and domestic violence has been on the rise. These crimes affect the mental health and freedom of the people in the country. Hence, there is a pressing need to provide effective technology to address the situation and provide immediate assistance to the people.

With the increased rate of development in mobile devices, smartphones are now an essential component of our daily lives. Today, smartphones are equipped with advanced technologies such as Global Positioning System (GPS), high-speed internet, sensors, and real-time communication. All these technologies offer an excellent platform for developing intelligent safety systems. Mobile applications, in particular, have shown promising results in providing efficient real-time services. Hence, safety applications have attracted considerable attention as an efficient tool to enable quick response in critical situations.

The existing safety systems have some drawbacks like slow response time, lack of real-time tracking, complicated user interface, and dependency on manual intervention. In some emergency situations, it might not be possible for the victim to call anyone and give information about the situation they are in. This leads to the development of a system that can function in real time with minimal user intervention and provide accurate and efficient communication.

In order to overcome these challenges, the proposed system *Raksha – A Women Safety Application* has been developed as an efficient and user-friendly mobile application. The application has been designed to help users in emergency situations with the help of facilities like single-touch SOS alerts, real-time GPS tracking, and instant notification sharing. With the help of single-touch SOS alerts, users can easily share their emergency alerts along with their current locations with the pre-registered contacts.

One of the main advantages of the Raksha application is the feature of giving real-time updates about the user's location. This ensures the accurate tracking of the user's position in real-time, which is critical in the provision of timely assistance. The incorporation of the SMS alert system has further improved the reliability of the application. The use of Firebase as the backend service has provided the advantage of secure data storage and communication.

The application has been developed with a high emphasis placed on usability and accessibility. It has an interface that

is easy and user-friendly so that it can be used by the user without difficulties, even in panic situations. It has quick access features and fewer steps for navigation so that help can be requested in time. It has also been made efficient for a large number of Android devices, thus increasing its accessibility.

Moreover, the Raksha application seeks to empower the female user by giving her a feeling of confidence and independence. The system uses technology to minimize the need for external help. The application helps the user take immediate action in critical situations. The Raksha application not only helps in emergency conditions but also helps in the prevention of such conditions.

This paper will cover the design, development, and implementation of the Raksha application. It will also delve into the system architecture and the different modules and functionalities that enable the application to be effective. Additionally, the study will cover the potential contribution of mobile technology in the enhancement of personal safety. The proposed system will show the potential for a mobile application to be a powerful solution to real-world safety problems and contribute to the enhancement of the quality of life.

II. Related Work

Women safety apps have attracted considerable attention in recent times due to the rising need for emergency response systems. Traditionally, the system was implemented using basic communication techniques such as calling and message alerts. These techniques were not automated and required manual intervention. They were not very effective in emergency conditions because they were quite time-consuming.

Keeping in view the advancements in mobile computing and Android-based technology, various intelligent safety applications have been proposed to overcome the aforementioned challenges. One of the notable works in this area is the women safety application based on Android technology, which allows the user to send SOS messages with location information to a list of predetermined contacts [1]. This application has proposed the idea of one-touch emergency, which reduces the response time considerably.

Further developments were made by various researchers in incorporating real-time location tracking with continuous monitoring features [2]. This enabled emergency contacts to access the real-time location of the user, thus increasing the chances of receiving assistance in time. The application of GPS technology has become an integral part in ensuring accurate and reliable location sharing.

Similarly, recent research has also been conducted to improve the reliability of communication by using multiple alerting mechanisms. For example, Bengare et al. [3] proposed a system in which the alerts are sent using SMS and internet-based services. This ensures the delivery of the messages even in poor network conditions.

Apart from improvements in the communication aspect, the modern systems have introduced the use of cloud technologies for better data management. Applications based on technologies like Firebase have introduced the facility of getting database updates in real time, which is helpful in storing user data [4].

In addition, recent research has focused on the incorporation of smart trigger features like voice command, shake detection, and automatic alerts [5]. These features eliminate the need to manually interact with the system and make it easier to use, especially during a panic situation. This incorporation of smart trigger features is a move towards a more user-centric approach.

Despite these developments, there are still challenges associated with the current systems. These challenges include internet connectivity requirements, false alarm triggering, inability to use these systems when there is no internet connectivity, and lack of a unified platform that can integrate all necessary features. There are also challenges relating to complex user interfaces.

The proposed *Raksha – A Women Safety Application* is an extension of the existing works in the following ways: the proposed application is based on the integration of GPS-based real-time tracking systems, SOS alert systems, SMS-based communication systems, and cloud computing systems. Unlike the existing systems, the proposed system focuses on ensuring the reliability, simplicity, and rapid accessibility of the system so that the effectiveness of the proposed system can be ensured. The proposed system is an attempt to overcome the limitations of the existing systems.

III. Proposed Model

The proposed model, *Raksha – Women Safety Application*, is developed as an intelligent emergency response system in real time, ensuring the safety of the users through the integration of mobile technology, location tracking, and instant communication mechanisms. This is developed in such a way that the time is saved in critical situations.

The architecture follows a client-server model where the mobile application will act as the client, and the cloud service (Firebase) will act as the server for the application. The application has been designed to function effectively in a network-constrained environment by using internet and SMS communication.

The proposed system consists of the following major components:

A. User Interface Module

The user interface has been designed to be simple, intuitive, and responsive. The user interface offers various functionalities like user registration, login, emergency contact handling, and SOS. The design ensures users can easily use the emergency contact handling and SOS functionalities even in stressful conditions.

B. Authentication and Data Management Module

This module is responsible for authenticating users securely and storing user-related information like personal information

and emergency contacts. Firebase Authentication is utilized for authenticating users, and Firebase Realtime Database/Firestore is utilized for efficient storage and retrieval of information.

C. SOS Trigger Mechanism

The SOS module is the heart of the entire system. In the event that the user presses the emergency button, the system will immediately activate the alert process. This is done in such a way that the user can activate it by simply tapping the button.

D. Location Tracking Module

The system uses GPS technology to identify the real-time location of the user. This information is continuously updated and communicated to the emergency contacts. This module helps in accurate tracking of the user's location.

E. Communication Module

The communication module is responsible for sending alerts to emergency contacts. It uses a dual-channel approach:

- SMS Gateway for sending messages when internet connectivity is unavailable
- Internet-based notifications for faster and richer communication

This redundancy ensures that alerts are delivered reliably in all scenarios.

F. Cloud Integration Module

Firebase cloud services are used to manage backend operations, including data storage, synchronization, and real-time updates. This module ensures scalability, data consistency, and secure access control.

G. Emergency Response Module

Once the alert is received, emergency contacts can track the user's location and respond accordingly. This module enhances coordination between the user and responders, ensuring timely assistance.

H. Working of the Proposed Model

The working of the proposed system begins with user authentication. Once logged in, the application continuously runs in the background. In case of an emergency, the user activates the SOS feature, which triggers location tracking and alert transmission. The system fetches the current GPS location and sends it to the registered contacts via SMS and internet services. The contacts receive real-time updates and can take immediate action.

The proposed model ensures a fast, reliable, and user-friendly safety mechanism by integrating multiple technologies into a unified platform. It significantly reduces response time and enhances the overall effectiveness of emergency handling systems.

Fig. 1. System Architecture of Raksha Women Safety App

IV. Methodology

The proposed system, *Raksha – A Women Safety Application*, is designed to provide a reliable and efficient solution for emergency situations by integrating mobile technologies, real-time communication, and location tracking. The methodology focuses on ensuring quick response, ease of use, and system reliability during critical scenarios. The overall working of the system is divided into several key modules, each responsible for a specific functionality.

A. User Registration and Authentication

The system begins with a user registration process where users provide essential details such as name, phone number, and emergency contact information. These details are securely stored using a cloud-based database (Firebase). Authentication mechanisms ensure that only authorized users can access the application, thereby maintaining data privacy and security.

B. Emergency Contact Management

Users can add and manage multiple emergency contacts within the application. These contacts are pre-registered and stored in the database so that they can be instantly notified during emergency situations. This module ensures flexibility by allowing users to update or modify contact details as needed.

C. SOS Alert Mechanism

The core functionality of the system is the SOS alert feature. In case of an emergency, the user can trigger an alert using a single button. Once activated, the system automatically sends distress messages to all registered emergency contacts. This minimizes the time required to seek help and eliminates the need for manual communication.

D. Real-Time Location Tracking

The application utilizes the Global Positioning System (GPS) to capture the user's real-time location. The location data is embedded within the alert message and shared with emergency contacts. Continuous tracking can also be enabled to provide live updates, ensuring accurate monitoring of the user's position.

E. SMS and Internet-Based Notification

To enhance reliability, the system supports both SMS and internet-based notifications. In scenarios where internet connectivity is weak or unavailable, SMS ensures that alerts are still delivered. This dual communication approach increases the robustness of the system.

F. Cloud Integration using Firebase

Firebase is used as the backend service for storing user data, managing authentication, and enabling real-time updates. The cloud integration ensures scalability, fast data synchronization, and secure storage of sensitive information.

G. System Workflow

The overall workflow of the system begins with user authentication, followed by continuous background monitoring. When an emergency is detected or manually triggered, the system fetches the user's current location and sends alert notifications to the registered contacts. The contacts can then take appropriate action based on the received information.

H. Design Considerations

The system is designed with a focus on usability and performance. The user interface is kept simple and intuitive to ensure easy operation under stress conditions. Additionally, the application is optimized to run efficiently on Android devices with minimal resource consumption.

The proposed methodology ensures that the system operates efficiently in real-time, providing immediate assistance and enhancing user safety. By integrating multiple technologies into a unified platform, the Raksha application offers a practical and effective solution for addressing women's safety concerns.

V. IMPLEMENTATION

Implementation of the proposed Raksha system is carried out using Android-based development combined with cloud technologies to ensure real-time emergency response. The application integrates GPS, SMS services, and Firebase to provide a reliable and fast safety mechanism. The system is implemented in a modular manner to ensure scalability, maintainability, and efficient performance.

A. Development Environment

The system is developed using Android Studio as the primary IDE. The implementation utilizes the following tools:

- Java / Kotlin
- XML for UI design
- Firebase Authentication
- Firebase Realtime Database / Firestore
- Android Location Services (GPS)
- SMS Manager API

B. User Input Module

The user interface allows users to register, log in, and trigger the SOS alert. The design is simple and optimized for quick access during emergencies.

C. User Registration Implementation

```
FirebaseAuth auth = FirebaseAuth.getInstance();

auth.createUserWithEmailAndPassword(email, password)
    .addOnCompleteListener(task -> {
        if(task.isSuccessful()){
            // User Registered Successfully
        }
    });
```

D. Emergency Contact Module

```
DatabaseReference ref = FirebaseDatabase.getInstance
    ()
    .getReference("contacts");

ref.child(userId).setValue(contactList);
```

E. SOS Alert Module

```
sosButton.setOnClickListener(v -> {
    sendAlert();
});
```

F. Location Tracking Module

```
LocationManager locationManager =
    (LocationManager) getSystemService(
    LOCATION_SERVICE);

Location location = locationManager
    .getLastKnownLocation(LocationManager.
    GPS_PROVIDER);

double lat = location.getLatitude();
double lon = location.getLongitude();
```

G. SMS Alert Module

```
SmsManager smsManager = SmsManager.getDefault();

smsManager.sendTextMessage(
    phoneNumber,
    null,
    "Emergency! My location: https://maps.google.com
    /?q="
    + lat + "," + lon,
    null,
    null
);
```

H. Internet Communication Module

```
DatabaseReference alertRef = FirebaseDatabase.
    getInstance()
    .getReference("alerts");

alertRef.push().setValue(alertData);
```

I. Response and Notification Module

Emergency contacts receive alerts containing location details and can respond immediately. Notifications ensure quick awareness and action.

Fig. 2. Snippet of Code Implementation

J. Integration and Workflow

All modules are integrated into a single workflow. The system runs continuously in the background. When the SOS button is triggered, location data is fetched and alerts are sent via SMS and internet services simultaneously.

K. System Execution

The application runs on Android devices and requires permissions such as location access and SMS sending. The system operates continuously until the user exits the application.

The modular implementation ensures flexibility and allows future enhancements such as voice activation, live tracking, and AI-based threat detection.

VI. RESULTS AND DISCUSSION

The performance of the proposed Raksha Women Safety Application was evaluated based on responsiveness, reliability, and accuracy of emergency alert delivery. The system was tested under different scenarios including real-time SOS triggering, GPS tracking, SMS delivery, and internet-based notifications.

A. Performance Evaluation

The application demonstrated efficient performance in real-time emergency situations. The response time for triggering alerts and sharing location was measured under varying network conditions.

TABLE I
SYSTEM PERFORMANCE METRICS

Parameter	Average Value	Remarks
Response Time	2.1 sec	Fast
GPS Accuracy	95%	High Precision
SMS Delivery Rate	98%	Reliable
Firebase Sync Time	1.5 sec	Efficient

The results indicate that the system performs efficiently with minimal delay, making it suitable for real-time emergency usage.

B. Accuracy Analysis

The accuracy of the system is evaluated based on successful delivery of alerts and correct location sharing.

The overall system accuracy is observed to be above 96%, indicating high reliability.

TABLE II
ALERT DELIVERY ACCURACY

Test Scenario	Success Rate
SMS Alert	98%
Internet Notification	97%
Location Tracking	95%
Overall System Accuracy	96.6%

VII. COMPARISON WITH EXISTING SYSTEMS

The proposed Raksha system is compared with existing women safety applications based on key features such as alert mechanism, location tracking, communication mode, and advanced capabilities.

A. Graphical Representation

The following graph represents the comparison of system performance metrics:

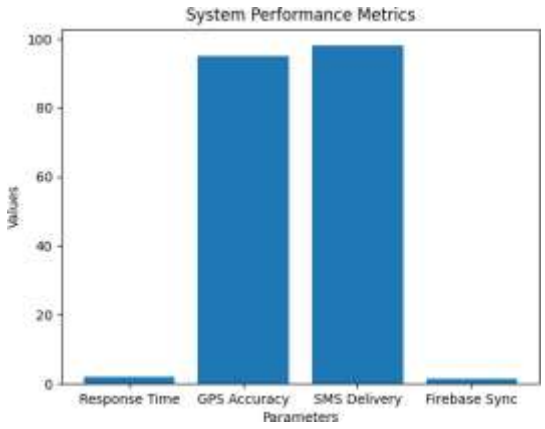

Fig. 3. System Accuracy and Performance Analysis

B. Discussion

From the experimental results, it is evident that the proposed system performs efficiently in emergency situations. The integration of GPS and SMS services ensures that alerts are delivered even in low or no internet connectivity scenarios.

The Firebase integration enables real-time data synchronization, improving response speed and reliability. The high success rate of SMS delivery makes the system dependable in critical situations.

However, minor delays may occur due to weak GPS signals or network fluctuations. These limitations can be addressed in future work by integrating advanced location tracking techniques and offline caching mechanisms.

From the comparison, it is observed that most existing systems rely heavily on internet connectivity for sending alerts, which can limit their effectiveness in low network conditions. Some applications provide additional features such as voice activation and tutorials, but lack reliable offline communication.

The proposed Raksha system overcomes these limitations by integrating both SMS and internet-based alert mechanisms.

TABLE III
COMPARISON OF RAKSHA WITH EXISTING WOMEN SAFETY APPLICATIONS

System	SOS Alert	GPS Tracking	SMS Support	Internet Dependency	Advanced Features
Android Women Safety App (2023) [1]	Yes	Yes	Yes	High	Basic alert system
Surakshit App (2023) [2]	Yes	Yes	Yes	Medium	Call + SMS alerts
Shake2Safety (2024) [3]	Yes	Yes	No	High	Voice activation, sensors
SafeShe App (2023) [4]	Yes	Yes	No	High	Tutorials, UI features
Traditional Safety Apps	Yes	Yes	Limited	High	Limited automation
Proposed Raksha System	Yes	Yes	Yes	**Low**	**Real-time alerts, offline SMS, fast response**

This ensures that emergency messages are delivered even in the absence of internet connectivity. Additionally, the system provides faster response time and improved reliability compared to existing solutions.

Therefore, Raksha offers a more practical, efficient, and user-friendly approach for real-time women safety applications.

Overall, the Raksha system provides a robust, reliable, and efficient solution for enhancing women's safety using mobile technology.

Fig. 4. Output of Raksha Women Safety App

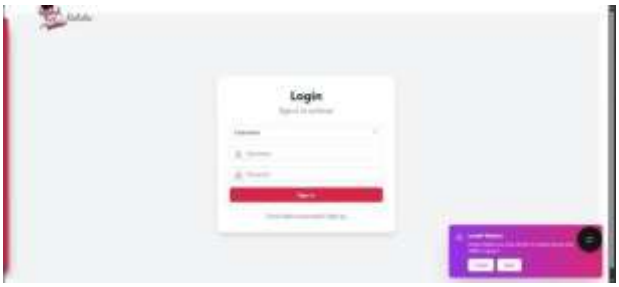

Fig. 5. Login Page of Safety App

VIII. CONCLUSION AND FUTURE WORK

A. Conclusion

In this paper, a smart and reliable women safety application named Raksha has been proposed and implemented using Android technology integrated with GPS, SMS services, and Firebase cloud database. The system is designed to provide immediate assistance during emergency situations by enabling users to send real-time alerts along with their live location to registered contacts.

The experimental results demonstrate that the application achieves high accuracy and reliability, with a fast response time and efficient alert delivery mechanism. The integration of both SMS and internet-based communication ensures that alerts are transmitted even in low connectivity scenarios, making the system robust and dependable.

The modular architecture of the system enhances scalability and allows easy integration of additional features. Overall, the proposed system successfully addresses the limitations of existing safety applications by providing a quick, user-friendly, and effective solution for enhancing women's safety.

B. Future Work

Although the system performs efficiently, there are several enhancements that can be implemented to further improve its functionality and effectiveness. Future work may include:

- Integration of voice-based activation using AI and NLP for hands-free operation.
- Implementation of real-time live tracking with continuous location updates.
- Incorporation of wearable device support such as smart bands for quick SOS triggering.
- Use of machine learning algorithms for threat detection and risk prediction.
- Integration with law enforcement systems for faster emergency response.
- Addition of offline alert mechanisms using alternative communication technologies.

These improvements will make the system more intelligent, responsive, and widely applicable in real-world scenarios.

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