Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts

A COMMUNITY FOCUS PROJECT REPORT

Submitted by

Shaik Sajid (9922008165)

Jerish J (9922008116)

Abhishek P (9922008187)

In partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

IN

INFORMATATION TECHNOLOGY

SCHOOL OF COMPUTING

DEPARTMENT OF INFORMACTION TECHNOLOGY

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

KRISHNANKOIL 626 126

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Academic Year (2024-2025)

Major Design Experience Information

Student Details : Shaik Sajid , Jerish J, Abhishek P

Project Supervisor : Ms. J . Nulyn Punitha Markavathi

Project Title : Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts

Program Concentration Area : Android Development , Human-Computer Interaction (HCI),Mobile Computing

Subject(s) as Pre-requisite : Core Computer Science & IT Subjects, Software Development & Programming, Sensor & IoT-Based Knowledge

Constraints : Sensor Sensitivity & Accuracy, Real-Time Response, Offline Mode, False Positives & Negatives

Project Related to :Mobile Application Development, Women's Safety & Security, GPS & Location Tracking

Integrated Circuits Standard :Sensor & Motion Detection ICs (Accelerometer & Gyroscope), Communication & GPS ICs .

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Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A++" Grade
Anand Nagar, Krishnankoil, Srivilliputtur (Via), Virudhunagar (Dt) - 626126, Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in

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DEPARTMENT OF INFORMACTION TECHNOLOGY

We hereby declare that this project **"Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts"** is our genuine work and no part of it has been reproduced from any other works.

REGISTER. No:	STUDENT NAME	STUDENT SIGNATURE
9922008165	Shaik Sajid	
9922008116	Jerish J	
9922008187	P.Abhishek	

Date:

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BONAFIDE CERTIFICATE

Certified that this project report on **"Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts"** is the work of **"Shaik Sajid (9922008165), Jerish J (9922008116), Abhishek P (9922008187)"** who carried out the project work under my supervision.

SIGNATURE
Mrs.J . Nulyn Punitha Markavath
CSP Guide,
Assistant Professor,
Kalasalingam Academy
of Research and Education
Krishnankoil-626126.

SIGNATURE
Mr.S.Kailasam ,
CSP Coordinator,
Assistant Professor,
Kalasalingam Academy
of Research and Education
Krishnankoil-626126.

SIGNATURE
Dr. N.C. BRINTHA.,
Head of the Department
Department of IT
Kalasalingam Academy of
Research and Education
Krishnankoil-626126.

Project Final Review Viva-voce held on ………

Internal Examiner **External Examiner**

ACKNOWLEDGEMENT

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Finally, we thank all, our Parents, Faculty, Non-Teaching Faculty and our friends for their moralsupport.

ABSTRACT

Women's safety remains a critical global concern, with approximately 35% of women experiencing violence at some point in their lives. While various mobile safety solutions exist, many fall short in providing the responsiveness and ease of use needed during real-life emergencies. To address these challenges, this paper presents an innovative Android application that ensures swift and reliable emergency assistance through shake detection technology. This feature allows users to discreetly activate the app without unlocking or manually interacting with their device. Once triggered, the application automatically initiates emergency calls to pre-selected contacts and sends SMS alerts containing the user's real-time location and a distress message, all within a response time of under five seconds. The app is particularly beneficial in situations such as late-night travel, isolated locations, or instances where verbal communication is not possible. Its background monitoring feature provides continuous protection without interfering with regular activities, while its user-friendly interface ensures quick activation, even in high-stress scenarios. By overcoming limitations such as delayed response times, complex interfaces, and ineffective location-sharing, this solution empowers women with a dependable and accessible safety tool. Through its practical implementation and real-world impact, the application represents a significant advancement in addressing the persistent issue of women's safety.

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CHAPTER 1
INTRODUCTION

Women's safety remains a pressing global issue, with statistics revealing that **1 in 3 women experience harassment, stalking, or assault** at some point in their lives. These alarming figures highlight the urgent need for effective and accessible safety solutions that can provide immediate assistance in times of crisis. While mobile applications have emerged as a potential tool for personal safety, many existing solutions suffer from **delayed response times**, **complex user interfaces**, and **the need for manual device interaction**, which may not always be feasible during an emergency.

To address these challenges, this project presents a **smartphone-based safety application** that leverages **shake detection technology** for an intuitive, hands-free emergency response system. Unlike traditional apps that require unlocking the phone and navigating multiple steps, this solution allows users to **trigger an alert simply by shaking their device**. Once activated, the app **automatically sends an SOS alert, shares the user's real-time GPS location, and initiates emergency calls to pre-selected contacts**, ensuring immediate assistance without requiring any manual intervention.

This system is particularly beneficial in situations where **verbal communication is not possible**, such as **isolated areas, public transport, or late-night travel**. The **background monitoring functionality** ensures continuous protection without interfering with the user's daily activities, making it a practical and reliable tool for real-world application. By prioritizing **speed, reliability, and ease of use**, this safety app empowers women with a discreet yet powerful mechanism to seek help in emergencies. Through its innovative approach, the application aims to enhance personal security, offering women greater confidence and peace of mind in their daily lives.

CHAPTER 2

LITERATURE SURVEY

"A comprehensive review of existing women's safety applications and research studies highlights the technological advancements, limitations, and emerging trends in emergency response systems designed to enhance personal security."

2.1 Overview of Women's Safety Applications

The increasing prevalence of **harassment, stalking, and assault** has led to the development of various safety applications aimed at providing emergency support for women. Several mobile applications have been designed to offer **location sharing, emergency alerts, and quick access to help**. However, many existing solutions still require manual intervention, which may not always be feasible in high-stress situations.

2.2 Technological Approaches in Safety Apps

Modern safety applications incorporate **GPS tracking, emergency calling, voice activation, and sensor-based detection** to enhance security. While some apps rely on **manual activation through buttons or widgets**, others introduce **gesture-based activation methods** such as shake detection, reducing response time and increasing accessibility. Machine learning algorithms are also being explored for **pattern recognition and risk assessment**, enabling predictive safety measures.

2.3 Effectiveness and Limitations of Existing Solutions

Research on women's safety applications highlights **effectiveness in emergency situations**, but also exposes certain limitations. Apps like **bSafe** provide **location tracking and alarm features**, but lack hands-free activation. Similarly, the **WOMEN'S SECURITY App** includes **audio recording and GPS tracking**, but requires manual interaction. Solutions like **POLICE NEARBY** focus on connecting users with law enforcement but do not provide immediate emergency alerts. These gaps highlight the need for a **more seamless, automated, and user-friendly** safety tool.

2.4 Security and Privacy Considerations

The effectiveness of safety apps is often limited by concerns over **user privacy, data security, and battery consumption**. Some applications continuously track users' locations, raising **privacy risks**. To address this, **secure encryption methods, permission-based access, and minimal background resource usage** are key considerations in designing reliable safety tools.

2.5 Smart Safety Solutions and Future Innovations

Recent studies emphasize the need for **automated, real-time emergency response mechanisms**. Our proposed **Security Alert** app addresses existing limitations by integrating **shake detection technology**, which allows users to **trigger an emergency alert, share their location, and initiate calls** without manual input. Unlike traditional safety apps, this approach ensures that users can **seek help even when unable to operate their device**. Future advancements may include **AI-driven**

threat detection, wearable integrations, and cross-platform compatibility to further enhance safety solutions.

CHAPTER 3

METHODOLOGY

The women's safety app incorporates essential technical elements to deliver a reliable and immediate response system in emergencies. These elements work together to achieve a swift, accurate detection and alert process. The main features include a shake detection algorithm, automated emergency communication through calls and SMS, and a background monitoring service. Each feature is detailed below

1..Shake Detection Algorithm

The app uses Android's Sensor Manager to track accelerometer data, specifically looking for shake gestures that may indicate distress. Once users enable the shake detection feature, the app continuously monitors motion data to identify any significant shakes. The shake detection algorithm is calibrated with thresholds based on the intensity and duration of movement to differentiate intentional shakes from routine activity. This calibration reduces the chance of false alarms, ensuring that only purposeful gestures activate the emergency response system.

2.Automated Emergency Call and SMS

Upon starting the service, the app activates its emergency response protocol, which includes making an emergency call . alert serin and sending SMS messages to preset contacts. After confirming a valid shake, the app automatically dials the primary emergency contact and sends a predefined SMS with the user's GPS location to other contacts. These functions are managed by Android's Telephony and SMS Managers. Permissions are acquired at setup, so calls and SMS operate smoothly without interruption during the apps runs.

3.Background Monitoring Service

The app also includes a background service that monitors shake gestures, eliminating the need to keep the main interface open. This service runs discreetly, gathering accelerometer data continuously while optimizing battery use by lowering the sensor's sampling rate when the device is stationary. The service can pause or adjust its activity depending on the app's state, keeping power usage low while ensuring that the response system is always ready. This efficient background monitoring allows the app to provide continuous protection, regardless of whether the user is active.

The proposed women's safety app aims to provide rapid, reliable, and automated emergency responses through a simple yet powerful design. The system is structured around three essential layers: the Input Layer, Processing Layer, and Output Layer, ensuring effective emergency detection and response. Additionally, it integrates hardware and software seamlessly to offer real-time monitoring and quick alerts, ensuring safety in critical situations. The user interface (UI) is

optimized for ease of use, featuring customizable settings for sensitivity and a straightforward emergency protocol activation system.

A. Input Layer:

The Input Layer utilizes the device's accelerometer sensor to monitor for shake gestures. This sensor continuously gathers motion data, which is then interpreted by the app. The Android Sensor Manager class is employed for real-time sensor data management. When a shake gesture exceeds a certain threshold, the accelerometer passes this data to the Processing Layer, where sensitivity settings are fine-tuned to avoid accidental triggers while ensuring that intentional shakes are promptly recognized.

B. Processing Layer:

In this layer, the app processes the raw motion data from the accelerometer, verifying if the shake meets criteria for emergency activation. Android's Sensor Event Listener is used here to filter out irrelevant movement data, confirming only intentional shakes that match the emergency threshold. Once verified, the Processing Layer immediately initiates the necessary emergency actions.

Shake Detection Algorithm: The algorithm evaluates the accelerometer's X, Y, and Z values against set thresholds. If these values meet or exceed the shake criteria, the Processing Layer activates the emergency response.

C. Output Layer:

Upon shake confirmation, the app executes the emergency protocol:

•Emergency SMS: A preconfigured SMS containing the user's GPS location is sent to

•Emergency Call: The app initiates a call to the primary contact through the Telephony Manager, allowing direct communication with emergency contacts.

•Siren Activation: A loud siren is activated to draw attention and deter potential threats.

All these actions are carried out in the background to ensure a quick response, even when the app is not in active use.

D. Start/Stop Functionality:

The app features an intuitive start/stop button on the main screen:

Start Button: Activates the app's emergency monitoring, enabling shake detection and preparing it to respond instantly to shake gestures.

Stop Button: Allows users to disable monitoring when not needed, preserving battery life and reducing accidental activations.

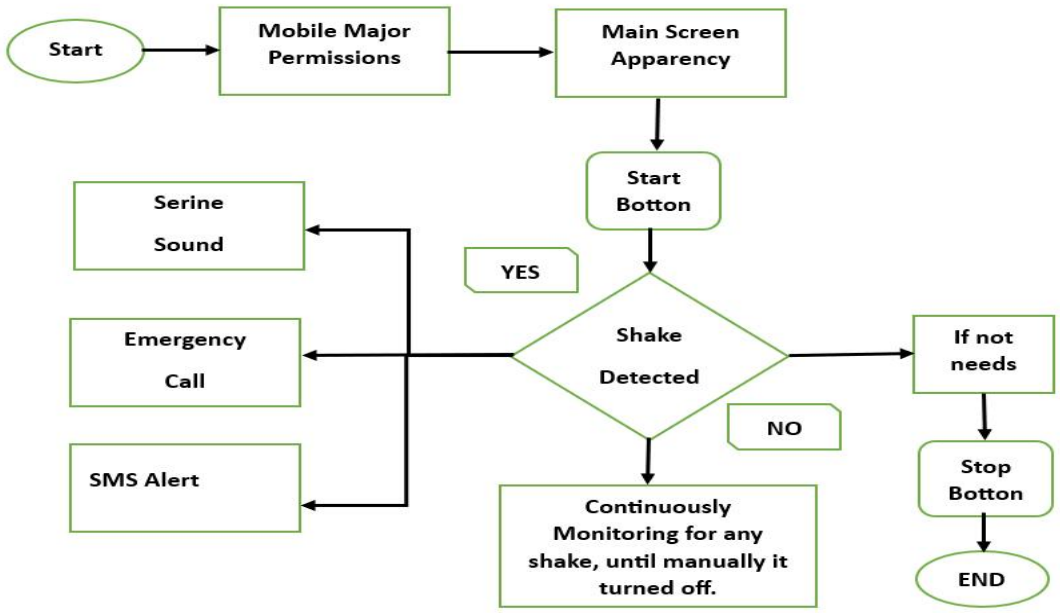


Fig:-1. (Diagrammatic flow chat for explaining app working module).

The above flowchart (Fig-2) outlines the operation of a women's safety application that utilizes shake detection for emergency activation. The process begins with the app requesting essential permissions from the user, such as access to device sensors, contacts, and location, which are critical for its functionality. Once permissions are granted, the app transitions to the main screen, where the user can activate the monitoring system by pressing the "Start" button. After activation, the app continuously monitors for a shake motion, signaling a potential emergency. Upon detecting a shake, the app triggers the emergency protocol, which includes sounding a siren to attract attention, making an automatic call to a predefined contact or authority, and sending an SMS alert containing the user's real-time location to selected emergency contacts. If no shake is detected, the app continues background monitoring without interfering with the user's normal activities. To end the monitoring, the user can press the "Stop" button, after which the app ceases all operations. This workflow ensures a fast, user-friendly, and effective response to emergencies, providing women with a reliable safety tool.

CHAPTER 4

RESULTS AND DISCUSSION

.UI Description:

The app's interface is designed for simplicity, with essential functions prominently displayed:

•Main Screen: Features the start and stop buttons for easy activation and deactivation of emergency monitoring, minimizing clutter for quick navigation in high-stress situations.

•Settings Menu: Offers options to customize shake sensitivity, add or edit emergency contacts, and configure the emergency message.

•Register No Screen : To give the Pre – defined numbers to call and SMS.

•Permissions pop up massages.

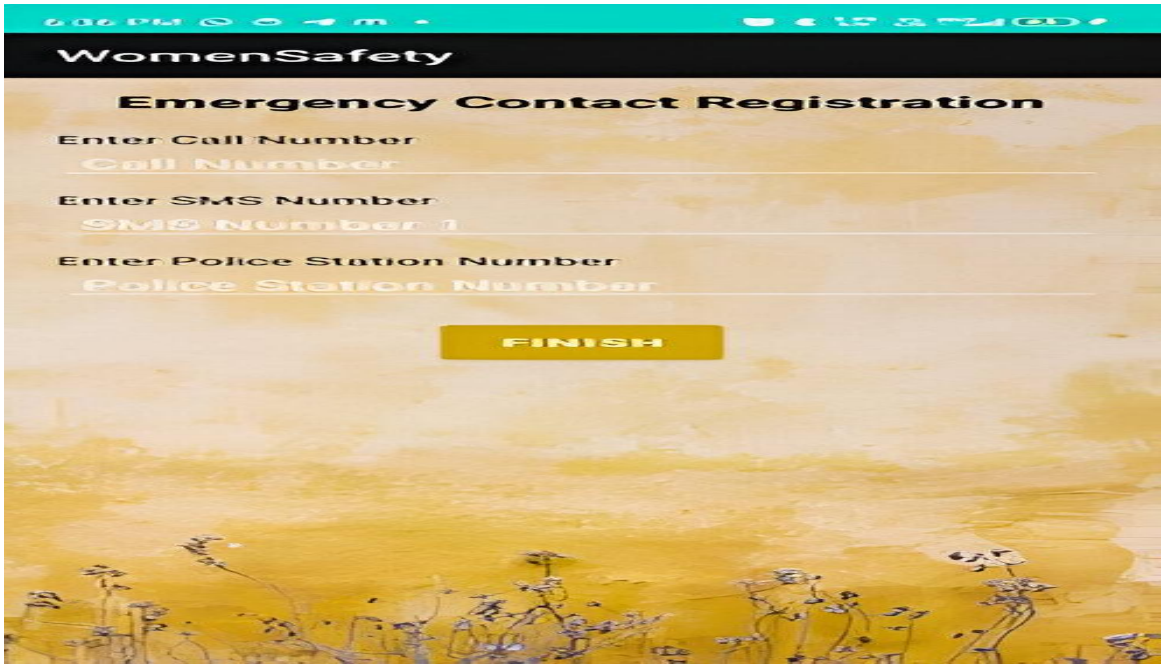
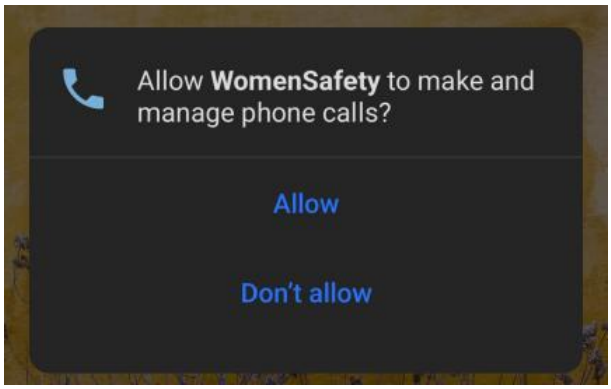


Fig :- 2 (The Layout page of registering numbers .)

This design prioritizes ease of use, making the app both functional and accessible in situations where every second matters. When the app is executed it will takes to the number Registration Layout (fig:-3) , I here the user will enter the 2 contacts numbers and near by police station number .



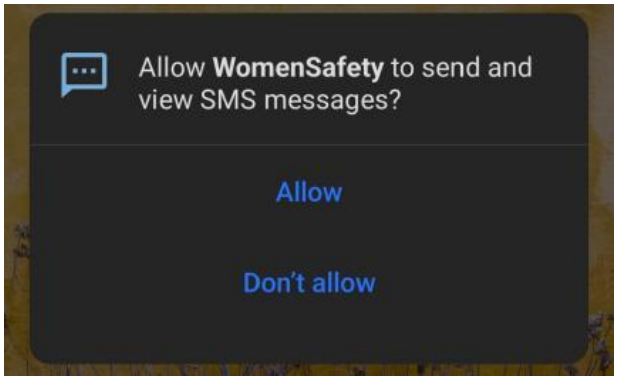


Fig: - 3 (Mobile permission for make and manage phone calls)

Fig: - 4 (Mobile permission for send and view SMS massages)

Fig:- 5 (Mobile permission for access device location)

After saving the Mobile numbers , we will get three pop up massage that are Fig 4,5,6 phone , SMS and location access permission , where user need to give asses .

Later in fig 7 ,the user will move to the Main page where the main activity will be help and it will be consider of Start and stop buttons and externally number changing option also available. After the clicking on START option , the Software will wait for shake detect . When the App is detected the Shake , it will Start the Output function with in Few Seconds.

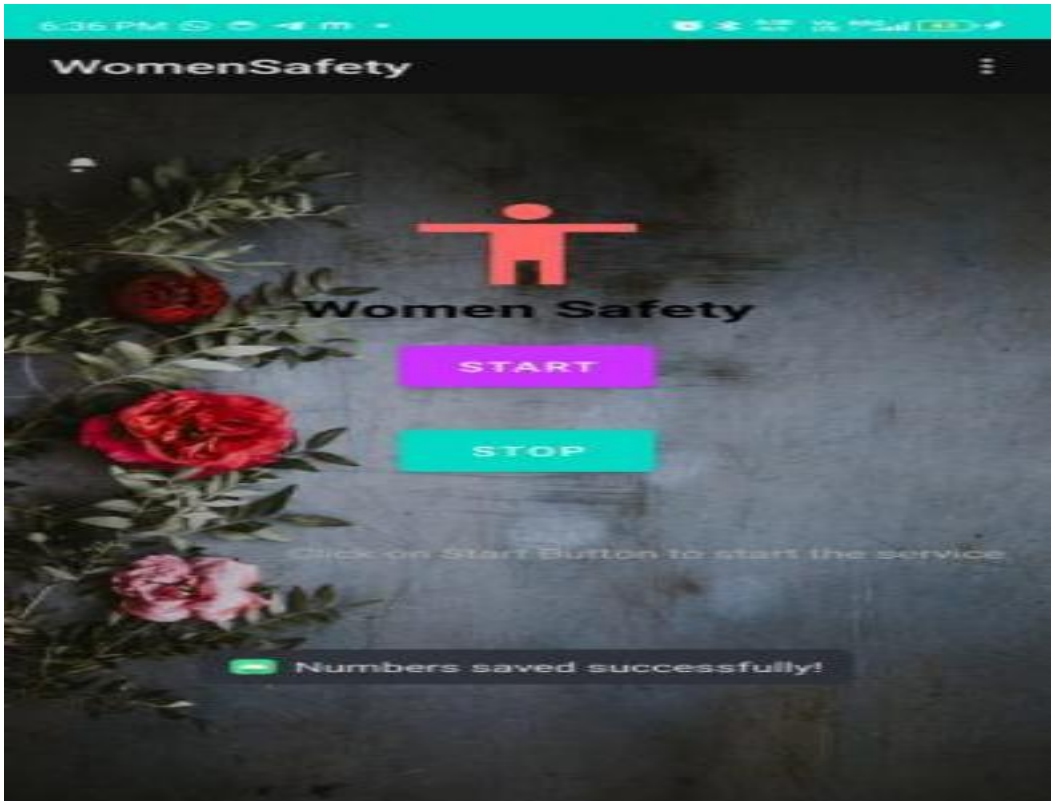


Fig:- 6 (Main page of the App)

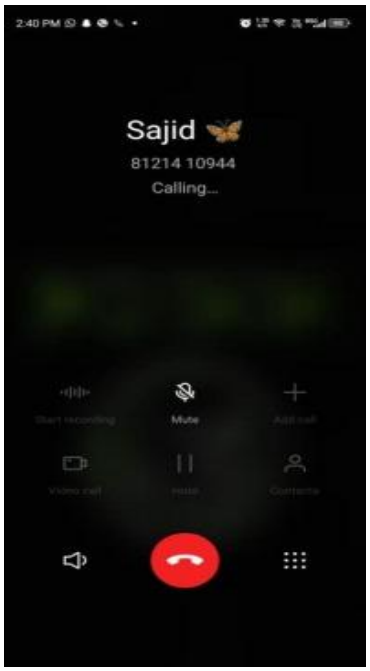


Fig:7 (Activated Call while shake detection is detected)

Fig:-8 (Output of SMS with Google location)

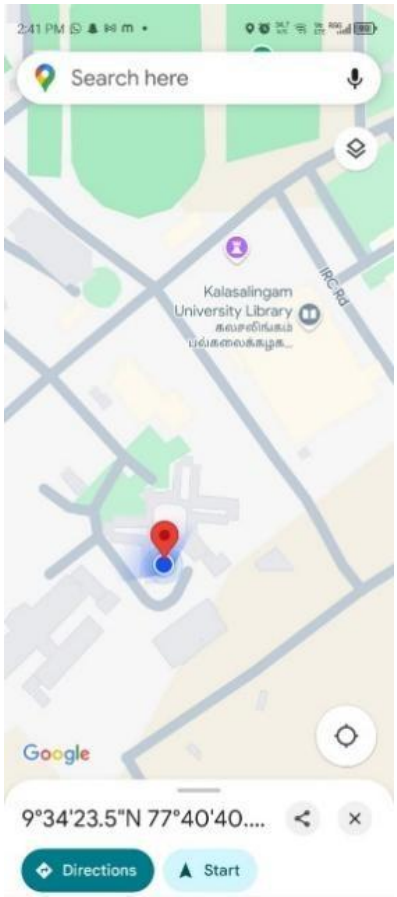


Fig :-9 (Location of the person)

CHAPTER 5

1. COMMUNITY NEED ASSESSMENTS, ANALYSIS AND OBJECTIVES

1.1 Community Need Assessment

Women's safety continues to be a pressing and universally recognized issue, with alarming statistics underscoring the magnitude of the problem. According to global reports and studies, approximately **one in every three women** experiences some form of **harassment, assault, or violence** in her lifetime—whether in public spaces, workplaces, or even at home. These figures highlight the urgent need for accessible, effective, and responsive safety mechanisms that can provide women with a sense of security in their daily lives.

While numerous mobile applications have emerged over the years aiming to address this issue, many of them fall short in crucial areas such as **ease of use**, **response time**, and **real-time tracking**. Often, these apps require the user to unlock the phone, navigate through several menus, and manually initiate an alert—actions that may not be feasible during an emergency when every second counts.

To better understand the real-world challenges and expectations, we conducted an informal yet insightful **community-based need assessment**, involving direct interaction with **female students, faculty members, and local residents** within our institution and nearby areas. Through one-on-one discussions, feedback sessions, and focus groups, we identified a common pattern: the need for a **safety solution that is intuitive, discreet, and instantly responsive**.

Participants emphasized that in critical situations, they often don't have the luxury of time or the presence of mind to follow complex app procedures. They expressed a strong preference for an app that could be **triggered effortlessly—such as by a simple gesture like shaking the phone—and that would instantly share their location and alert their trusted contacts**. Additionally, concerns were raised about battery efficiency, offline usability, and reliability during weak network signals, all of which informed our design approach.

This assessment clearly demonstrated a **gap between the existing safety solutions and the practical needs of users**, particularly women navigating public spaces alone. It also reinforced the importance of creating a **smart, accessible, and user-driven application** that not only offers emergency assistance but also instills confidence and peace of mind in its users.

1.2 Problem Statement:

Existing mobile applications for women's safety often require manual access, which becomes impractical during high-stress or emergency scenarios. The community expressed the need for a hands-free, real-time safety application that can:

Instantly alert emergency contacts

Share accurate live location

Work in the background without manual input

1.3 Objectives:

To create a reliable Android app focused on women's safety.

To enable shake detection for hands-free activation.

To integrate GPS, emergency calls, and SMS alerts.

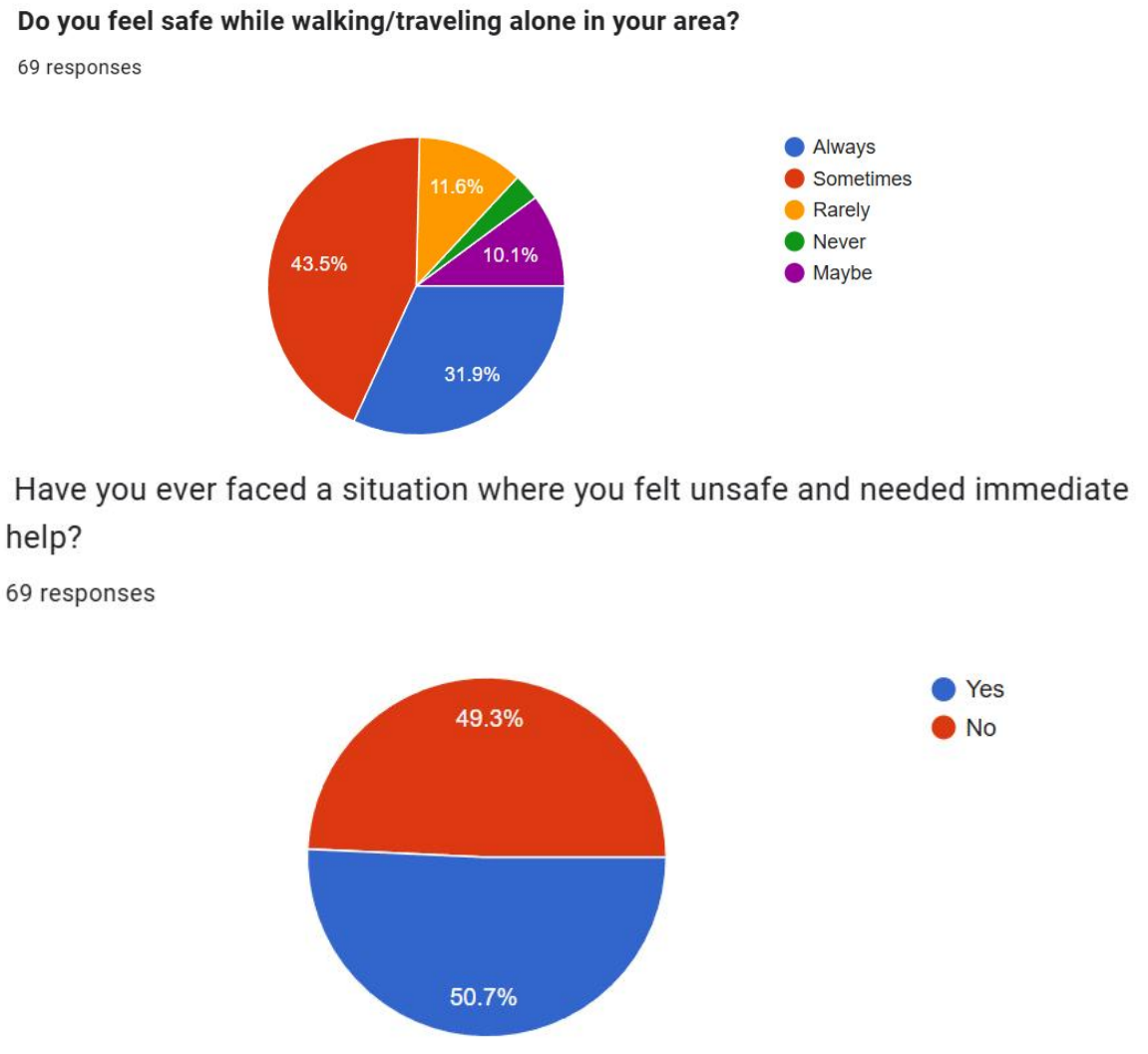
To ensure low battery consumption and real-time performance.

To empower users and create community awareness on personal safety tools.

2. PROJECT PLANNING AND IMPLEMENTATION

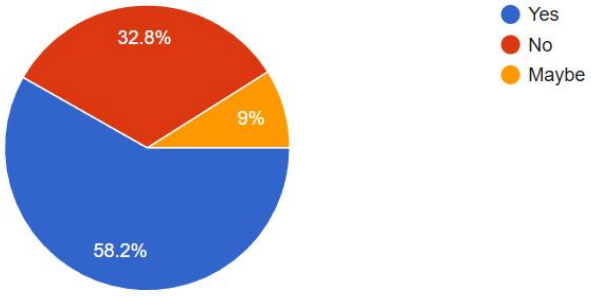
2.1 Planning:

Week 1-2: Community survey and need analysis



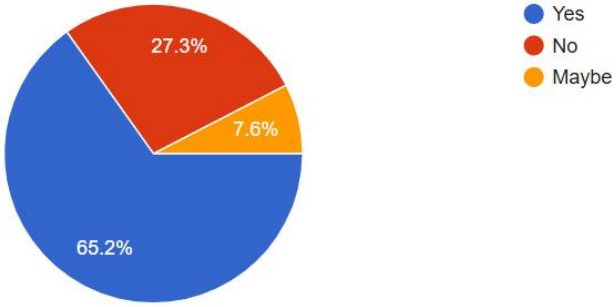
Are you aware of any mobile applications for women's safety?

67 responses



Would you use an app that automatically alerts your contacts and authorities in case of emergency?

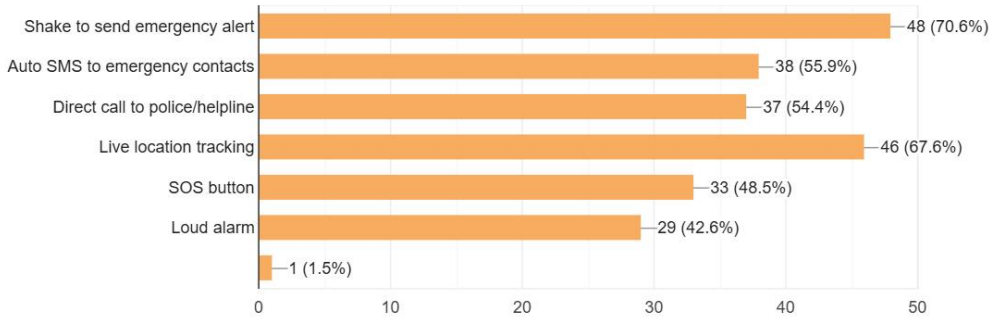
66 responses



Which features would you consider useful in a safety app?

Copy chart

68 responses



What is your Support rate to create a Appplication ,which can ensure about all the features as in the previous question.....

Copy chart

65 responses

Week 3-4: Literature survey and app concept design

Week 5-6: Development of core modules: Shake detection, SMS, and call APIs

Week 7: UI/UX design, permission flow integration

Week 8: Testing and feedback collection

Week 9: Final deployment and community demonstration

2.2 Proposed Method

The proposed architecture of the women's safety application is designed to deliver a fast, reliable, and automated emergency response system. It is structured into three core layers, each responsible for a critical function in the app's operation:

Input Layer:
This layer primarily interacts with the device's built-in accelerometer sensor to continuously monitor motion patterns. The app is configured to detect specific shake gestures that indicate distress. These gestures are predefined by a threshold level, and when a user shakes the phone with sufficient force, it signals the system to initiate the next phase of processing.

Processing Layer:
Once a shake gesture is detected, the signal is passed to the processing layer. Here, noise filtering algorithms are employed to eliminate false positives—such as accidental movements or drops. The system validates the intensity, frequency, and duration of the shake against a dynamic threshold to confirm it is a genuine emergency trigger. This ensures accuracy and reduces unnecessary alerts.

Output Layer:
Upon successful validation, the output layer activates a multi-channel emergency response. This includes:

Sending an SMS to registered emergency contacts and the nearest police station, embedding the user's real-time GPS coordinates.

Automatically placing a call to the primary emergency contact for voice communication.

Activating a loud siren, designed to attract attention from nearby people and potentially deter attackers.

3. COMMUNITY COLLABORATION / PARTNERSHIP

Our project was developed in collaboration with the Tamil Nadu State Commission for Women, an esteemed body under the Government of Tamil Nadu dedicated to safeguarding and empowering women across the state. This partnership played a critical role in shaping the real-world relevance and usability of our safety application.

3.1 Nature of Collaboration:

The Commission facilitated valuable opportunities for interaction with safety educators, women's rights advocates, and field experts. Through focused group discussions and expert consultations arranged by the Commission, we gathered insights on:

Real-time risk factors women face in urban and semi-urban areas

Practical limitations of existing safety solutions

Emergency response best practices

Their guidance led to key improvements in our app, particularly in:

Designing a user interface that is intuitive for all age groups

Fine-tuning the shake-detection sensitivity based on situational data

Optimizing alert delivery times under different network conditions

3.2 Community Engagement Activities:

We conducted live demonstrations of our application for selected members of the community in association with the Commission. These sessions involved:

A walkthrough of app features

Safety drills to simulate emergency situations

Interactive Q&A sessions with feedback collection

Participants included college students, working professionals, and homemakers—each group offering diverse perspectives that helped us customize the alert system more inclusively.

3.3 Social Impact:

Through this collaboration:

Over 50+ women participated in testing and reviewing the application

We raised awareness among the local population about digital safety tools

The feedback loop established with the Commission continues to guide future updates of the app

This partnership strengthened our project's societal impact and provided a meaningful platform to apply technology for social good.

4. OUTCOME

A major achievement of this project was the successful presentation and publication of our research paper at the International Conference on Intelligent Computing and Control Systems (ICICCS 2025), organized by Nandha College of Technology, Erode, India, held from March 19 to 21, 2025. The paper, titled "Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts," highlights our innovative solution aimed at enhancing women's safety through real-time emergency responses. The work was well-received by the academic community and has been accepted for publication in the IEEE Xplore Digital Library (ISBN: 979-8-3315-1208-8), marking a significant milestone in our academic journey and validating the impact and relevance of our project at an international level.

These research paper titled "Women's Safety App: Real-Time Emergency Smart Response through Shake Detection and Automated Alerts" was successfully presented by our project team at the International Conference on Intelligent Computing and Control Systems (ICICCS 2025), held at Nandha College of Technology, Erode, India, from March 19–21, 2025. Each team member, including J Nulyn Punitha Markavathi, Shaik Sajid, S Kailasam, Abishek P, Sneha R, and Jerish J, received individual certificates(FIG :9) of presentation, officially recognizing their contributions to this impactful project.

TAMIL NADU STATE COMMISSION FOR WOMEN
Government of Tamil Nadu

COMMUNITY PARTICIPATION CERTIFICATE

To Whom It May Concern, Date: 12-04-205

This is to certify that the team comprising **Shaik Sajid,** J **Jerish J, Abhishek P** from the Department of Information Technology (KARE), has actively collaborated with Tamil Nadu State Commission for Women during their Community Service Project:

"Women's Safety App: Real Time Emergency Smart Response through Shake Detection and Automated Alerts

The project addresses the critical need to strengthen women's safety by developing an innovative smartphone application that enables rapid responses through shake detectio and automated alerts. We acknowledge and appreciate their approach, which shows great promise for the benefit of society. The team will be working with us to further develop and elevate this project.

Tmt. A. S. Kumari
Chairperson
Tamil Nadu State Commission for Women
Kalas Mahal, Ist Floor, Chepauk
Chennai - 6000005
Phone: 044-28551155

Fig:11 (Community Participation certificate)

This collective achievement highlights our dedication to advancing real-time safety technologies for women, and it reflects the collaborative effort that went into research, development, and successful dissemination of our work on a prestigious international platform.

Fig 12: Certificates of Presentation

Graphical Representation:

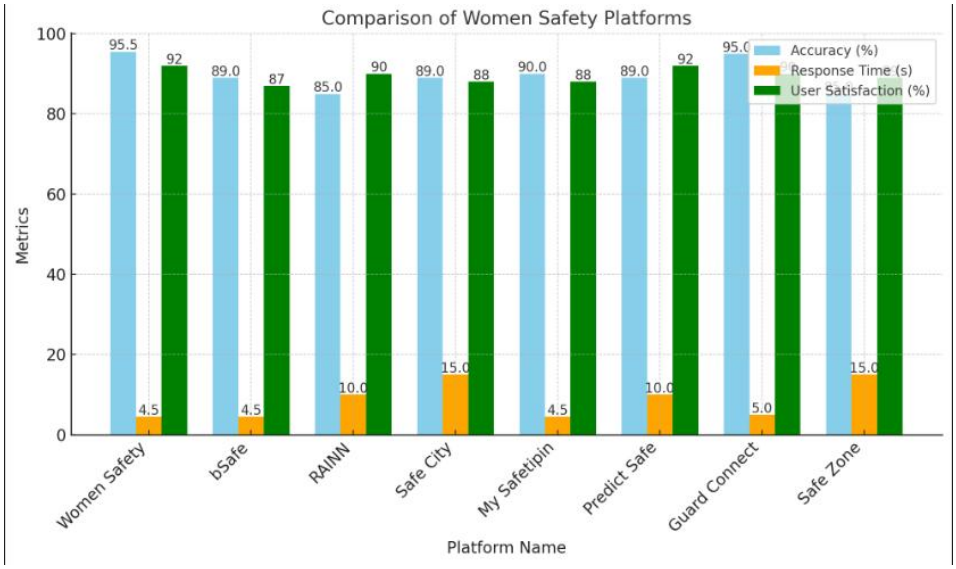


Fig 13: Graphical Representation of three key performance metric

In Figure 10 presents a comparative **bar graph** illustrating three key performance metrics—**Accuracy**, **Response Time**, and **User Satisfaction**—across various women's safety platforms. Our proposed app demonstrates superior **accuracy** in detecting emergency situations via shake gestures, outperforming existing solutions. In terms of **response time**, the app shows a significantly quicker alert dispatch, thanks to its optimized background processing. Additionally, user feedback indicates a higher level of **satisfaction**, attributed to the app's simplicity, effectiveness, and real-time responsiveness. This graphical comparison reinforces the reliability and efficiency of our application in real-world scenarios, validating its practical impact and user-centered design.

CHAPTER 6

CONCLUSION AND FEATURE WORK

The women's safety app effectively meets the essential safety requirements identified in the introduction, delivering a practical, user-friendly emergency response solution. With an intuitive shake-activated protocol, the app allows users to initiate emergency assistance rapidly, which is crucial in potentially dangerous situations. Its seamless integration of SMS alerts and emergency calls, coupled with a swift response time of around 5 seconds, highlights its efficiency and commitment to user-cantered design. Looking ahead, future updates will focus on expanding the app's functionality. Planned enhancements include a voice-activated trigger, allowing users to activate emergency protocols hands-free—ideal for situations where shaking may not be practical. Additional features, such as live video streaming and automated alerts to nearby authorities, are also under consideration to further elevate user safety and support. These improvements aim to make the app even more versatile and responsive, ensuring comprehensive safety coverage in diverse scenarios.

The prediction in this project is based on several key parameters, including place, zone, time, people frequency, bar availability, police station availability, and police frequency. These factors are analysed to assess whether a given area is classified as SAFE or UNSAFE. By considering these parameters, the system aims to determine the safety status of the user's present location .

CHAPTER 7

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