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

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***Abstract*— Women's safety remains a significant global challenge, with nearly 35% of women experiencing some form of violence during their lifetime. Despite the availability of mobile safety solutions, many fail to provide the responsiveness and ease of use required in real-life emergencies. These limitations hinder their effectiveness in ensuring timely intervention and support when it is needed the most. This paper introduces an innovative Android application designed to offer a reliable and swift response system for women facing potentially dangerous situations. By leveraging shake detection technology, the app can be activated discreetly and effortlessly without requiring the user to unlock or interact with their device actively. Once triggered, the application automatically initiates emergency calls to pre-selected contacts and sends SMS alerts with the user's real-time location and a predefined distress message. With a response time of under 5 seconds, the app facilitates prompt assistance, which can be life-saving in critical moments. The solution is particularly useful in scenarios such as late-night travel, isolated areas, or situations where verbal communication is not feasible. Its background monitoring functionality ensures continuous protection without interfering with daily activities, while its simple interface allows for quick activation, even under stress. These features address key challenges such as delayed response times, complicated user interfaces, and inadequate location-sharing capabilities that have plagued existing solutions. This application aims to empower women by providing them with a dependable and accessible safety tool, fostering confidence and peace of mind in their daily lives. Through its practical features and real-world applicability, this solution represents a significant step forward in tackling the persistent issue of women's safety.**

Keywords*— *Women's Rights, program Support, Feminism, Societies, Current, Crimes, Personal Care.

I. INTRODUCTION

In recent years, increased awareness of women's safety issues has highlighted the importance of immediate emergency support for women, particularly in situations where they may be isolated or unable to verbally request assistance. According to recent data, 1 in 3 women globally faces harassment, stalking, or assault, underscoring the need for accessible safety tools that prioritize speed, reliability, and ease of use.

Smartphones, being ubiquitous, offer an ideal platform for developing responsive safety solutions. However, many current safety apps fail to provide an intuitive, hands-free experience, instead requiring users to unlock their devices and navigate through multiple steps, which can delay assistance in critical moments. Addressing these limitations, our app leverages a unique shake detection feature to minimize user interaction while ensuring a reliable emergency response. With the capability to send alerts, share GPS locations, and make emergency calls automatically, the app transforms any smartphone into a discreet, efficient safety tool, built to activate with a simple shake

II. LITERATURE SURVEY

To gain a comprehensive understanding of the current solutions in women's safety, we reviewed various existing applications and research studies. This analysis focuses on each app's key features, its effectiveness, and areas that could be enhanced. Through this review, we identified the common technological approaches being utilized and the gaps in existing solutions, providing insight into potential

advancements for more robust safety applications. Below is an overview of some prominent Android safety apps, each offering unique emergency support functions.In order to develop an effective women's safety application, a comprehensive review of existing solutions was conducted, focusing on prominent mobile applications and relevant research studies. This analysis revealed insights into the functionality, effectiveness, and limitations of current solutions, identifying areas where technological advancements could create more robust safety tools. The following paragraphs provide an overview of popular Android safety apps, each of which offers distinct features to support users during emergencies. The bSafe app was developed as a mobile safety solution to enhance personal security, particularly for women, in response to growing concerns about harassment and assault. Its features include an emergency alarm and location sharing, which provide users with a sense of security in daily activities. The app's popularity highlights the demand for personal safety tools but underscores the need for additional enhancements to respond more effectively in emergencies [9]. Another widely used app, the WOMEN'S SECURITY App by AppSoftIndia, requires users to input critical contact information, allowing quick notifications to be sent to designated contacts when triggered. This app includes a unique feature: it records 45 seconds of surrounding audio, which, along with the user's GPS location, is sent to emergency contacts. Its widget-based activation simplifies use, ensuring the app can be deployed with a single touch in high-stress moments [14].POLICE NEARBY, launched in 2013, provides a simple way for users to locate nearby police stations and make direct contact through their Android devices. The app categorizes police stations based on proximity, allowing easy access for those in need, especially students and local residents. The app's simplicity, free download, and lack of registration make it highly accessible; however, it lacks features for immediate emergency response, which could be beneficial in critical situations [8]. Another valuable application, My Safetipin, emphasizes urban safety by allowing users to assess and rate the safety of public spaces based on lighting, crowd density, and other factors. Studies have shown that My Safetipin empowers users, especially women, to make informed decisions on safe routes, contributing significantly to public safety efforts [12].Our app, Security Alert, is designed to address gaps in these existing solutions by enabling hands-free activation through shake detection, which initiates SMS, calls, and alarms within seconds. Unlike many apps that rely on manual input, Security Alert's real-time shake detection triggers an automated response, enhancing ease of use and response time. Additionally, the app's background monitoring feature conserves battery life while ensuring continuous protection, making it a more adaptable and user-centred safety tool. The adaptability of Android also supports advanced functionalities like shake detection, which minimizes user interaction and provides rapid response during emergencies. Future versions of Security Alert aim to expand compatibility to iOS and Windows, promoting inclusive safety solutions across platforms [2].The global legislative framework addressing violence against women is extensive, with over 1,583 measures in place across 193 countries. Key focus areas include laws on domestic violence, human trafficking, and sexual violence, with 354, 322, and 272 respective laws. This legislative support reflects a global commitment to protecting women from harm in both private and public settings. However, certain areas—such as female genital mutilation and femicide—receive comparatively fewer legislative measures, which may be attributed to cultural or regional variations in enforcement and prioritization. The existence of these laws represents a critical step toward safety, but their effectiveness is contingent upon consistent enforcement and supportive resources to aid victims and hold offenders accountable [3, 4, 5, 14].

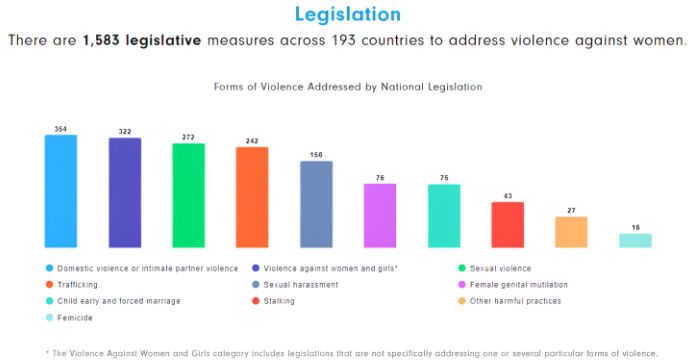


Fig:-1 (Legislative measure across 193 countries)

Empowering women with essential tools, resources, and rights is key to fostering safe and supportive environments. Empowerment enables women to actively participate in society, pursue personal and professional development, and make informed choices in areas like education, healthcare, and employment. Studies emphasize that empowerment significantly contributes to women's safety and well-being, supporting their ability to navigate public spaces and access resources effectively [3, 6].Urban safety models increasingly integrate technology, real-time data, and community engagement to enhance public security. A conceptual model called the Safe City framework, developed to reduce crime through surveillance and community collaboration, highlights the role of citizen participation and data sharing in building safer urban spaces [11]. Machine learning is also being employed in safety tools, analysing historical data to identify patterns and predict risks. Such technology has proven effective in various industries, advancing safety decision-making and risk assessment, and demonstrates potential for further application in personal safety tools [13, 15].The Security Alert app aims to contribute meaningfully to society by empowering women with essential, accessible tools for emergencies. This app allows users to easily alert trusted contacts, access emergency services, and activate quick communication channels, which are critical during high-stress situations. Security Alert not only focuses on individual protection but also fosters community awareness and encourages collective responses to emergencies. Its features, such as real-time location tracking, automated alerts, and loud alarms, help notify nearby people of an emergency, promoting a shared response. Through continuous improvement and integration of user feedback, Security Alert aims to close gaps in current safety measures, working toward a society where women feel safer, more empowered, and supported in their everyday live.

This study introduces a novel approach to enhancing women's safety by prioritizing effective and rapid response in emergency situations. Unlike conventional safety

applications that rely solely on manual inputs, our system incorporates shake detection technology to automatically trigger emergency alerts. This ensures that help can be requested even when the user is unable to access their phone due to distress or danger. Additionally, the app integrates real-time emergency call and SMS functionality, instantly notifying pre-selected contacts and emergency services with the user's live location. The lightweight and intuitive user interface further ensures that actions can be taken swiftly, minimizing delays during critical moments. By combining sensor-based automation with instant communication features, our approach significantly improves response time and enhances personal security, making it a more efficient and proactive solution compared to existing systems.

III. Proposed Method

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.

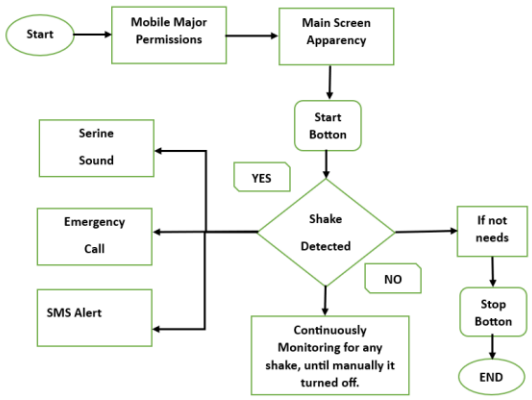


Fig:-2. (Diagrammatic flow chat for explaining app working module).

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.

E.Features:

The app incorporates several auxiliary features for enhanced security:
•GPS Location Tracking: The app integrates GPS tracking within the emergency SMS, providing real-time location data to help contacts locate the user quickly.

•Siren Sound: When activated, the app emits a loud siren to attract attention and deter potential threats. This sound is audible from a significant distance, drawing help from nearby individuals.

•Background Monitoring: The app runs a background service that continuously monitors for shake gestures, ensuring round-the-clock protection. This service is optimized for battery efficiency, allowing extended use without excessive power drain

G.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.

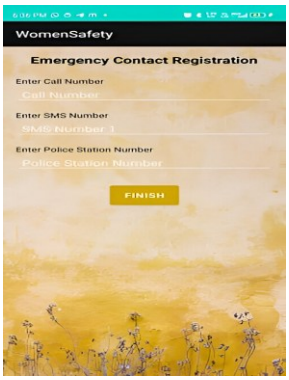
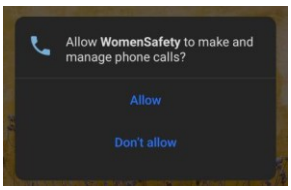


Fig :- 3 (The Layout page of registering numbers .)

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 .



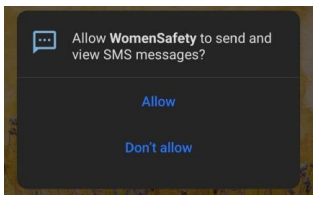


Fig: - 4 (Mobile permission for make and manage phone calls)
Fig: - 5 (Mobile permission for send and view SMS massages)

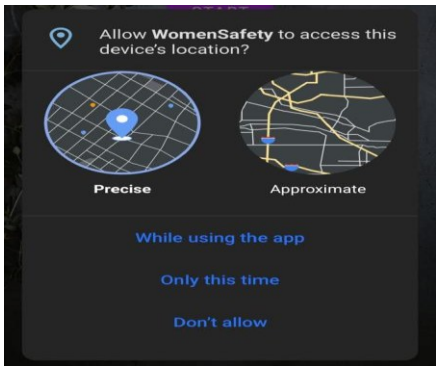


Fig:- 6 (Mobile permission for access device location)

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.

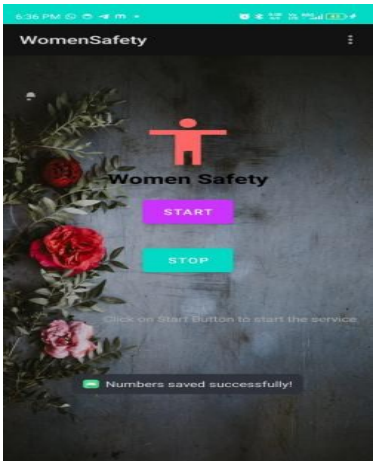


Fig:- 7 (MAIN PAGE OF THE APP)

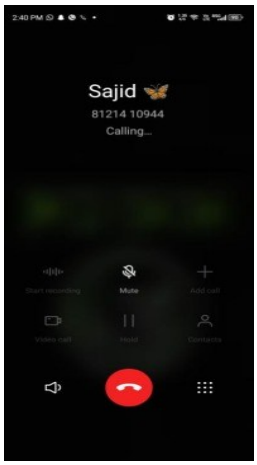


Fig:8 (Activated Call while shake detection is detected)

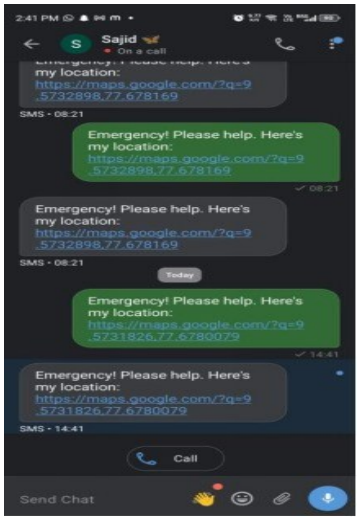


Fig:-9 (Output of SMS with Google location)

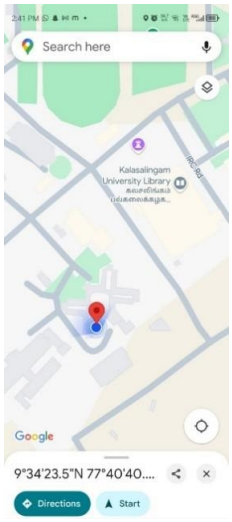


Fig :-10 (Location of the person)

IV. IMPLEMENTATION

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.

V. TABLE OF COMPARISION OF EXISTING AND PROPOSED APPS AND WEBSITES

Table I

Platform Name	Accuracy (%)	Response Time (s)	User Satisfaction (%)
Women Safety	95.5	4.5	92
bSafe [9]	89	4.5	87
RAINN [10]	85	10	90
Safe City [11]	89	15	88
My Safetipin [12]	90	4.5	88
Predict Safe [13]	89	10	92
Guard Connect [14]	95	5	90
Safe Zone [15]	85	15	89

The analysis of the table reveals that the proposed Women Safety mobile app excels in all key metrics, achieving the highest accuracy (95.5%) and user satisfaction (92%) while maintaining a swift response time of 4.5 seconds. Among existing mobile apps, bSafe and My Safetipin share similar response times but lag behind in both accuracy and user satisfaction compared to the proposed app. For websites, the proposed GuardConnect outperforms others with an impressive accuracy of 95% and a faster response time of 5 seconds, indicating significant improvements over existing platforms like SafeCity and RAINN.

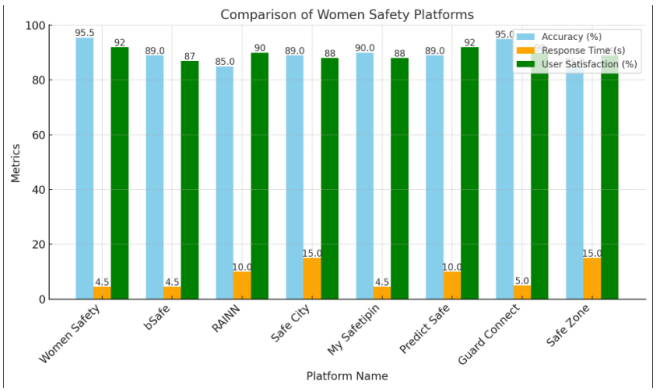


Fig: -11 (Graphical representing of the table 1)

In Fig 10 there was a graphical representation of table 1The proposed PredictSafe website also shows enhanced user satisfaction (92%) and response time compared to its existing counterparts. In general, mobile apps demonstrate faster response times (4.5 seconds) compared to websites, which range from 5 to 15 seconds. User satisfaction is generally higher for mobile apps, with the proposed Women Safety app standing out as the most efficient and user-friendly solution, while Guard Connect leads in the website category. Overall, the proposed platforms exhibit substantial advancements in accuracy, efficiency, and user satisfaction compared to the existing solutions.

VI. Conclusion

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.

VII. Future Work

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 .

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