A Comprehensive Review of "WeHeroes": Women Safety App

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***Abstract*— The Women Safety App is designed to enhance personal security by offering an integrated platform of safety tools for women in emergency situations. Key features include SOS emergency calls and messages with real-time location tracking, a shake detector for emergency alerts, and nearby police station navigation. Additionally, the app allows users to receive community-based SOS notifications, helping them stay informed about local emergencies and safety concerns. The app also features a Safety Score for locations, offering real-time assessments of the safety levels of specific areas based on various risk factors. Users can stay informed with safety news and access trusted taxi services for safe transportation. By leveraging location services, communication APIs, and emergency protocols, the app empowers women to take proactive safety measures, ensuring timely assistance and peace of mind in environments.**

Keywords*— *Women Safety, GPS, Mobile Application, Emergency Services, Real-time Location Tracking

I.INTRODUCTION

The increasing incidence of crimes against women worldwide has intensified concerns regarding their safety in both public and private spaces. Despite the existence of laws and regulations aimed at protecting women from domestic violence, sexual harassment, and various other forms of crime, effective enforcement remains a significant challenge. As a result, many women continue to feel vulnerable and uncertain about their safety. This vulnerability is exacerbated by the fact that women often hesitate to leave their "safe zones," thereby limiting their freedom and mobility; critical situations can arise unexpectedly and in any environment.

This paper proposes the development of a Women's Safety App, which focuses on providing a reliable, efficient, and responsive tool to enhance the safety of women in distress . Traditional emergency systems, such as calling the police, often exhibit significant limitations. Victims may find themselves unable to communicate their location or even make a call due to fear, physical constraints, or other emergencies. Consequently, women's safety has emerged as a pressing concern, highlighted by the increasing reports of violence and harassment. In response, governments and increasing reports of violence and harassment. In response, governments and organizations have begun investing in resources and campaigns aimed at addressing this issue. However, practical technological solutions continue to evolve. Mobile applications designed specifically for women's safety represent one of the more promising solutions in this realm. With smartphones being widely accessible and portable, these applications can offer immediate assistance in distressing situations.

In an era where personal safety is a growing concern, especially for women, there is a critical need for technological solutions that can provide timely assistance and reassurance. Safety App seeks to address this pressing issue by offering a comprehensive suite of safety features designed to ensure rapid responses in emergency situations.

Key functionalities of the app include:

- An SOS feature that instantly notifies trusted contacts while simultaneously transmitting the user's real-time location.
- A directory of nearby police stations to facilitate easy access to assistance.
- A location tracker enabling friends or family members to monitor the user's whereabouts in real time.
- Helps users plan safe routes and avoid high-risk areas based on safety score.
- Community SOS notifications, which alert users about nearby emergency situations or threats reported by others in the community, fostering collective awareness and timely responses to local safety issues.

The app leverages the portability and accessibility of smartphones to offer timely, proactive safety measures, aiming to empower women and enhance personal security in any environment.

II. LITERATURE SURVEY

Chowdhury et al. [1] conducted a statistical analysis of NFHS-5 data to explore intimate partner violence (IPV) disparities across socio-economic groups in India. While this study provides valuable insights into the socio-cultural factors influencing women's safety, its focus remains limited to statistical exploration without proposing practical, technological solutions for addressing IPV. This gap in technological intervention underlines the need for solutions like mobile apps that can offer real- time protection mechanisms, a focus of the current app proposal.

Sharmila et al. [2] reviewed existing technologies aimed at improving women's safety and identified key features such as emergency alerts, tracking, and voice commands. However, the study lacks depth in discussing user experience or addressing specific needs across diverse demographics. While the identified features are useful, a more thorough examination of user interface design and personalization options would improve the app's usability for a broader audience. This is particularly important for ensuring that the app is accessible and intuitive for women from different backgrounds, a factor critical for its adoption.

Sharma et al. [3] developed an Android-based safety app incorporating essential features like SOS alerts and real-time location tracking. Though comprehensive in its technical scope, the study does not cover the deployment or user testing phases extensively, limiting insights into the app's real-world applicability. This omission of user feedback is significant as usability and responsiveness are key factors in ensuring the success of safety apps in emergency situations. Incorporating these phases in your project would be essential to evaluate the app's effectiveness in diverse, real-world contexts.

Similarly, Kolte et al. [4] developed an Android-based app that enhances women's safety with features like live tracking and panic buttons. Their focus on optimizing location tracking and real-time response is highly relevant to the technical improvements needed for your app, especially in ensuring swift emergency responses. However, the study overlooks user privacy concerns, which should be a priority in your project, especially when handling sensitive information such as location data.

More et al. [5] introduced "Sakhi-The Saviour," an app that offers emergency alerts and location sharing with predefined contacts, triggered through voice commands. This feature is particularly relevant for enhancing user interaction, especiallyin situations where physical access to the phone may be compromised. The app could benefit from broader emergency-triggering options, a consideration that would add value to your own app by incorporating multiple triggers (e.g., shake detection, voice commands).

Srinivas et al. [6] emphasized secure data transmission in their safety app, ensuring that user location and emergency contacts are protected. This focus on security is vital for your project, given the sensitive nature of the data involved. However, their study does not address the potential trade-offs between security measures and app's performance, an issue that warrants further consideration in your design to avoid delays in sending alerts during emergencies.

Masud et al. [7] introduced the "Go Fearless" app, which incorporates crowd-sourced safety features like real-time incident reporting. While this feature promotes community engagement, the reliance on user-generated data introduces challenges such as inconsistencies and a lack of structured verification processes. Your project could integrate a more reliable system for verifying reported incidents, perhaps through collaboration with local law enforcement agencies or community watch groups.

Kulkarni et al. [8] discussed the integration of user feedback in their app development process, creating a more responsive development cycle. This practice is highly beneficial, as it allows developers to continuously improve the app based on real-world feedback. However, they do not explore how to incentivize or streamline user feedback. Your app could address this by offering intuitive feedback options or periodic in-app surveys to ensure users are motivated to provide insights without detracting from their safety experience.

Harini et al. [9] emphasized the use of voice commands to trigger emergency alerts, enhancing ease of use during high-stress situations. While this feature is a strength, the paper does not explore how users might become overwhelmed by too many features or alerts, which could lead to "feature fatigue." A critical consideration for your app is balancing functionality with simplicity to ensure the app remains user-friendly in emergency situations.

Ramesh Kannan et al. [10] focused on the back-end integration of real-time alerts and location data using advanced algorithms. This technical focus is highly relevant to our project, particularly in ensuring that data transmission is synchronized across multiple devices and platforms. However, their paper does not discuss how to handle potential connectivity issues, which could be a significant barrier in low-network areas. Considering this in your app design could ensure that emergency alerts still function even when connectivity is weak.

The reviewed studies provide valuable insights into the technological features needed to enhance women's safety. However, they often overlook critical aspects such as real-world usability, privacy concerns, and user feedback. There is also a lack of exploration into making features like voice commands and location tracking more inclusive for women from diverse socio-economic backgrounds. Additionally, integrating safety apps with external systems, such as law enforcement databases, is minimally discussed. To improve the effectiveness of our Women Safety App, we aim to address these gaps by emphasizing usability across different demographics, ensuring secure data transmission, and incorporating real-time verification and emergency services

III. PROPOSED METHODOLOGY

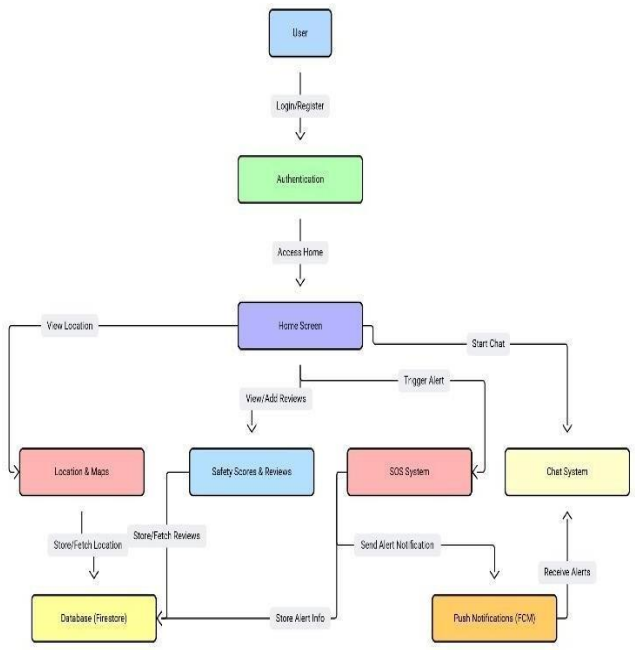
A. Problem Identification and Gap Analysis

The development of "We Heroes" began with a thorough analysis of existing women's safety systems, remaining a significant concern globally with alarming rates of harassement, violence, and unsafe situations occurring in both public and private spaces. Despite the advancements in technology, access to immediate assistance during an emergency is often limited, especially when victims cannot quickly contact help or provide their location. There is a need for a reliable, user-friendly mobile solution that can empower to feel safe, send emergency alerts and provide real-time location tracking in threatening situations.

B. System Design and Architecture

1. User Workflow

WeHeroes involves a incorporates a user-friendly interface series of steps that users follow to access and make use of app features for their safety requirements. Below is the user flowchart:



1) User Registration and Onboarding:
The user signs up or logs in using email. During the onboarding process, the app requests permissions for location, camera, microphone, and sending SMS/calls. The user sets up predefined emergency contacts and configures the SOS, Shake, and other features.

2) Home Screen:
The home screen displays key functions like SOS, Map, Camera, Emergency Helpline Numbers, and other safety tools. Quick-access buttons for emergency features are available for fast activation.

3) SOS Activation:
The user can press the SOS button to instantly send an alert message or call their emergency contacts. The app sends the user's current GPS location and predefined alert message to the registered contacts via SMS or call. The SOS can also be triggered by voice commands or a specific shake pattern.

4) Location Tracking and Safe Route Guidance:
Using the Map feature, the app continuously tracks the user's current location.The map displays safe routes and marks crime-prone areas, providing safer path recommendations for the user.Nearby police stations are shown on the map, helping the user locate assistance quickly.

5) Shake Detection for Help Messages:
If the user cannot access the phone's screen, they can shake the phone to trigger an emergency alert. When the shake frequency crosses a predefined threshold, the app automatically sends an SOS message with the user's location to emergency contacts.

6) Camera for Evidence Capture:
The user can capture images or record videos by pressing the Camera button or using a voice command. The media is stored locally for future reference, providing potential evidence in dangerous situations.

7) Nearby Police Stations:
The app uses the user's GPS location to display a list of nearest police stations. The user can navigate to the nearest police station directly from the app for immediate assistance.

8) Self-defense News and Techniques:
The News feature offers the latest updates on self-defense techniques, safety tips, and precautions. This keeps the user formed about methods to protect themselves in dangerous situations.

9) Helpline Numbers:
The app provides quick access to important helpline numbers, allowing users to call emergency services like the police, fire department, or women's helpline directly from the app.

- Workflow of Application:

1) Primary Interaction: The user can trigger emergency features (SOS, Shake) with a single tap.
2) Secondary Interaction: The app offers additional safety tools like map navigation, nearby police stations, self-defense news, and cab booking.
3) Emergency Alert Flow: SOS and Shake features send help messages with location to predefined contacts.
4) Post-Emergency: The user can view captured media, review the route taken, or check police station locations if needed.

This workflow is designed to ensure that the user has multiple quick-access options to get help in real- time, depending on the nature of the situation.

C. Tech Stack

1. Frontend:
The frontend part of the application is built by Flutter, the versatile and mighty framework. This framework empowers the ability to create beautiful interfaces, with the app thus running perfectly.

2. Backend:
Firebase Functions power the backend operations, which basically include managing and updating the database with server-side . All these serverless functions ensure scalability, reliability, and an efficient manner of handling real-time data.

3. Database:
The application shall employ Firebase Firestore, a NoSQL cloud-based database that boasts great scalability as a data management, it can really work well along with Flutter systems.

D. Proposed Algorithms and Features

1. User Registration and Login

WeHeroes includes using Firebase Authentication for user registration process, allowing registration via email and password. Firebase would validate credentials, ensuring that users are registered based on their preference or role.

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2. Distance Calculation Algorithm

The Haversine formula would be used to calculate the distance between two points based on latitude and longitude. This formula ensures accurate distance measurements for cost calculation and route optimization.

3. Location Tracking Algorithm

To enable real-time location tracking in a Flutter app, the geolocator or location package is used to request GPS permissions and check if location services are enabled. Once granted, getPositionStream() continuously monitors the user's latitude and longitude. The updated location is then displayed on a map using Google Maps Flutter or similar plugins for real-time tracking.

4. SOS System Algorithm

When the user triggers an SOS (via button, shake, or voice command),the app then retrieves their location using getCurrentPosition(). An emergency message with the user's name, GPS coordinates, and alert text is prepared. The alert is sent via SMS or direct call using flutter_sms or url_launcher. If real-time tracking is needed, location updates are periodically shared via Firebase Cloud Messaging (FCM) or SMS.

5. Community SOS AlertAlgorithm

When a user triggers the Community SOS, the app retrieves their location and prepares a notification with their user ID, GPS coordinates, and a Google Maps link. Firestore is queried to find nearby users who have enabled community alerts, filtering those within a 3 km radius using the Haversine formula. An FCM notification with the SOS details is sent to these users. When clicked, the app opens Google Maps to guide them to the SOS location.

6. Safety Score Algorithm

The Safety Score is calculated based on factors like crime rate, user reports, time of day, and real-time crowd density. The app retrieves crime data and user-submitted reports for a given location, assigning weighted scores to different risk factors. Machine learning or predefined heuristics analyze the data to generate a safety rating. The score is then displayed on the app, helping users assess the safety of their surroundings.

E. Unique Features

1. Safety Routes Based On Safety Zones:

Provide a safety score for locations based on crime rates, lighting, crowd density, and other factors using public data and user feedback. Helps users plan safe routes and avoid high-risk areas.

2. Community SOS Alerts:

Notify nearby app users in the community when someone sends an SOS alert, allowing them to respond immediately. Creates a network of support and increases the chances of rapid assistance.

3. User-Friendly Interface:

The app is designed to be simple and accessible. Its intuitive approach to the layout and clean interface empower old and young with equal ease in the interaction with the app.

4. Emergency Helpline Numbers:

WeHeroes app includes the emergency helpline numbers of the government which can be used when required.

F. Testing and User Feedback

The WeHeroes Women's Safety App will undergo testing with users to assess its SOS functionality, location tracking, and community alert system. Performance indicators like SOS response speed, notification precision, and app stability in areas with weak network coverage will be monitored. User insights will help refine the interface, making it user-friendly and accessible, especially for individuals with minimal technical expertise. The goal is to enhance reliability and ensure the app effectively supports users in emergencies.

IV. EXPECTED OUTCOMES

The WeHeroes Women's Safety App is designed to enhance personal security through real-time tracking, SOS alerts, and community-based emergency response. These anticipated outcomes stem from the app's design and features, although further testing and user feedback will refine its effectiveness.

A. Faster Emergency Response

By enabling instant SOS alerts to emergency contacts and nearby users, the app aims to reduce response time in critical situations. Real-time location tracking ensures that help can reach the user faster, a feature that significantly improves upon traditional emergency response methods.

B. *Enhanced Personal Safety*

The system is expected to improve the mobility of residents in rural areas by providing a flexible and convenient alternative to public transport. RideSync's focus on real-time ride scheduling, offline capabilities, and minimal data usage makes it especially accessible for users in regions with connectivity issues, differentiating it from existing carpooling systems that require continuous internet access.

C. *Increased Community Engagement*

The Community SOS feature encourages local users to respond to emergencies within their vicinity, fostering a sense of collective responsibility. This engagement is expected to create a safer environment by leveraging nearby help, an aspect often overlooked in existing safety apps.

D. *Reliable Functionality in Low Connectivity Areas*

The app is designed to function effectively even in areas with limited network coverage by storing critical data offline and sending alerts once connectivity is restored. This ensures that users in remote locations remain protected, addressing a major limitation of many urban-centric safety applications

E. *Improved Trust and User Confidence*

With features like location sharing, emergency calls, and real-time updates, the app is expected to build user confidence in personal safety measures. Women and other at-risk individuals will feel more secure knowing that assistance is just a tap away.

F. *Scalability and Adaptability*

The app's flexible architecture ensures easy customization and scalability across different regions. It can be adapted to various user needs, including integrating with smartwatches or expanding its reach to new locations, making it a long-term safety solution. These expected outcomes highlight the app's potential to revolutionize personal safety by ensuring fast, reliable, and community-driven emergency responses.

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