SHEild — A Smart Safety Platform for Women

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Abstract — In the present scenario, women's safety is becoming a highly concerned and continuously challenging issue because of increasing harassment, stalking, abduction and other critical incidents. Existing safety applications mostly depend on mobile-based actions or manual intervention, which may not be feasible in stressful or emergency situations. In order to overcome these issues, a unified smart solution that operates through a web platform is required to ensure continuous monitoring, real-time alerting and evidence generation. SHEild is a smart, web-based women safety system developed using modern web technologies that enables the victim to instantly trigger an emergency mode by pressing the SOS button for more than three seconds. Once activated, the system captures the user's geolocation, initiates automatic audio and video recording, activates a loud siren to gain public attention, and sends emergency notifications to emergency. The system also stores multimedia evidence securely in the database, enabling users to download them whenever required. By merging real-time tracking, multimedia capturing and instant alerting in a single web application, SHEild offers a highly effective and reliable assistance platform for women's safety.

Index Terms: Women Safety, Web Application, Emergency Alert, Geolocation Tracking, Audio-Video Recording.

I. INTRODUCTION

Over the past decade, concerns related to women's safety have increased significantly due to the rising number of incidents such as harassment, molestation, abduction and physical assault. These situations often occur unexpectedly, and the victim may not have enough time or freedom to manually contact family members or police authorities. Traditional mobile applications or manual calling may fail due to fear, unavailability of immediate access, or inability to operate the phone under pressure.

To mitigate these issues, there is a need for a *smart, easily accessible and automated web-based platform* that can assist women during emergencies. SHEild is designed as a fully web- operated safety mechanism that only requires access to a browser. The system provides continuous monitoring and real- time emergency response features integrated within one platform. The core objective of SHEild is to ensure that whenever a woman faces any unforeseen danger, she can initiate an emergency alert with minimal effort by holding the emergency button for more than three seconds.

After triggering, the system *accurately detects geolocation, captures audio and video automatically, activates a loud siren, and notifies nearby authorities and emergency contacts*. All captured media is securely uploaded to the database, ensuring that evidence is never lost. The web application also allows users to maintain emergency contacts, monitor live incidents and download stored proofs.

This paper presents the detailed structure, functioning and analysis of SHEild as a modern solution for improving women's safety through a completely web-driven approach.

II PROBLEM STATEMENT

Women today face increasing levels of harassment, stalking, physical abuse and potential life-threatening situations, often without immediate access to help or support. Most existing safety mechanisms depend heavily on mobile applications, manual dialing, or wearable devices which may not be available or operational during panic situations. Additionally, many applications lack automated evidence generation, real- time continuous tracking, or cloud-based storage that preserves the authenticity of the incident. The problem becomes more severe when the victim is unable to unlock her smartphone or initiate a phone call in a stressful situation. Therefore, there is a strong requirement for a simple, reliable and browser-accessible platform that can trigger emergency alerts, collect evidence and notify contacts instantly without depending on additional hardware. The core problem addressed by the proposed system is the absence of an

integrated, web-based safety solution that operates automatically upon activation and ensures secure and continuous monitoring of the victim.

III OBJECTIVES

The main objectives of the SHEild system are as follows:

1. To provide a simple yet reliable emergency alert system using a web-based interface.
2. To enable a long-press activation mechanism that prevents accidental triggers.
3. To continuously track the victim's geolocation in real- time and transmit it securely.
4. To automatically capture audio and video evidence without requiring user interaction.
5. To activate a loud siren for public attention or allow silent-mode operation based on user safety.
6. To store all captured data in secure storage for future legal use.
7. To immediately notify emergency contacts with location and incident details.
8. To offer a browser-based safety solution with no requirement for downloading additional apps.

IV SCOPE OF THE WORK

The scope of this project covers the implementation of a browser-based women safety system with the following functional areas:

Covered in the System

- SOS activation using long-press button
- Real-time geolocation tracking
- Audio and video evidence capture
- Siren activation and silent mode
- Storage of evidence
- Notification to emergency contacts
- Web-based dashboard for monitoring

Not Covered

- IoT hardware devices
- Offline GSM or SMS-based communication
- Wearable sensor integrations
- AI-based threat detection

V RELATED WORKS

Several prior systems have tackled parts of the emergency-alert/ Women-safety problem; however, none combines web-app activation, continuous live geolocation, automatic audio– video evidence captures, high-decibel siren activation from the browser, and evidence storage & download in a single, purely web-based platform as SHEild does. Representative prior works are summarized below.

1. Chitthi — A Web Application Enhancing Personal Safety — This recent IRJET study presents a web-first safety platform that supports live location sharing, SOS alerts and geofencing. It demonstrates the viability of purely web-based approaches (React + Firebase) for personal safety and shows how browser technologies can be combined to enable location sharing without a native app. However, Chitthi focuses on location and geofencing and does not present integrated automated audio/video evidence capture or a high-decibel siren triggered from the browser.

2. Emergency Response App with Socket.IO & WebRTC A research prototype integrates geolocation APIs with Socket.IO and WebRTC to provide real-time location and media streaming for emergency response. The paper shows how WebRTC can be used to stream media to a central server/dispatcher and how socket-based messaging supports low-latency location updates, which are both technologies SHEild leverages for live tracking and media upload. The prototype is oriented toward mobile apps but the techniques translate directly to web-app implementations.

3. Real-Time Location Trackers & Group Coordination Projects — Several recent projects describe group location trackers implemented as web apps (Leaflet/Maps + WebSocket) for team coordination and fleet tracking. These works demonstrate reliable 1–2 second location update cycles and scalable WebSocket-based architectures-important design patterns we adopt for SHEild's continuous tracking.

4. AI/Audio-based Emergency Detection (Scream Detection / Audio Triggers) — Research on automated audio-detection (scream detection or distress-sound classifiers) shows that audio-based event detectors can reliably detect distress sounds in many scenarios and be used to auto-trigger alerts. These studies inform SHEild's optional audio-analysis pipeline (background detection / automatic snippets) and motivate continuous audio capture during the SOS state for stronger evidence and potential automatic detection.

5. Multimedia Evidence & Video Review for Emergency Auditing — Clinical and emergency-

response literature highlights the value of recorded video for post-incident auditing and investigation (video review improves incident reconstruction and accountability). These findings support SHEild's focus on secure cloud storage and downloadability of audio/video evidence for legal and investigation use.

6. Real-Time Crime Detection using Computer Vision (YOLO / ML) — Several recent systems integrate on- device or server-side vision models (YOLO) to detect suspicious behaviour and automatically start recording and alerting. Those works illustrate how automated visual analytics can complement manual SOS triggers with pre- or post-event detection, which we identify as future work for SHEild.

Table 1 Comparison of Technologies Used

SL No	Technology	Advantage	Disadvantage
1	Web Application Platform	No installation required, accessible on any device	Depends on stable internet connection
2	Geolocation API (Browser GPS)	Real-time tracking, high accuracy outdoors	Reduced accuracy in indoor areas
3	MediaRecorder API	Automatic audio capture, direct file generation	Limited browser compatibility
4	WebRTC Camera Access	Instant video recording, no external app needed	Requires camera permission
5	Cloud Storage (Firebase/AWS)	Secure backup, easy retrieval	Needs continuous connectivity
6	WebSockets	Fast real-time communication, low latency	High server load during peak usage
7	JavaScript-Based Siren Trigger	Loud alarm attracts attention	Browser audio permissions may block sound
8	Email/Notification Services	Wide reach, immediate alerts	Possible email delivery delays
9	Real-Time Map Integration	Live route tracking and visualization	API limits, may incur charges
10	Secure Authentication (HTTPS/JWT)	Protects user data and access	Certificate management

VI METHODOLOGY

The methodology of the proposed SHEild system describes the complete operational workflow beginning from the initiation of the emergency alert to the storage of evidence and notification of the concerned contacts. The entire process is executed through a web-based platform that utilizes modern browser APIs, server-side processing and data storage. The following steps illustrate the working procedure of the system in a systematic manner.

1. Emergency Trigger Activation
The emergency alert mechanism begins when the user presses and holds the SOS button on the web interface for more than

three seconds. This long-press mechanism is intentionally implemented to avoid accidental triggers and to ensure that the signal received by the system is intentional. Once the three- second threshold is crossed, the system automatically shifts into emergency mode without requiring any additional user input.

2. Geolocation Acquisition and Real-Time Tracking After the SOS state is activated, the system immediately invokes the browser- b a s e d geolocation to obtain the user's current latitude and longitude. The location values are continuously fetched at periodic intervals and transmitted to the backend using secure communication. The live coordinates are also displayed on an interactive web map, allowing authorities or emergency contacts to monitor the user's movement in real- time.

3. Automatic Audio Recording
Simultaneously, the system activates the Media Recorder to capture ambient audio from the user's device microphone. This audio serves as important evidence for understanding the nature

of the emergency. This real-time capture ensures no loss of crucial information.

4. Automatic Video Recording
In addition to audio, the system accesses the device camera to initiate video recording Video evidence is crucial for capturing visual surroundings, identifying suspects and understanding the environment of the incident.

5. Siren Activation
To attract nearby public attention and to create

deterrence for the attacker, the system triggers a high-decibel siren sound through the web browser. This siren is generated and is designed to be loud enough to alert surrounding individuals.

Notification to Emergency ContactsOnce the emergency mode is active, the system sends alert messages to all pre-saved emergency contacts. The immediate dispatch of notifications ensures quick response and assistance.

6.   Termination of Emergency Mode
The emergency state continues until the user manually stops the SOS mode or until help reaches the user.

Once deactivated, the system stops capturing media, halt's location updates, and closes the siren playback. All collected data remains available for viewing or downloading by the authorized user.

VII IMPLEMENTATION

This section describes the practical implementation of the proposed SHEild web-based women safety platform. The chosen stack for the prototype is shown below and is implemented to be lightweight, scalable and secure.

Stack used (prototype):
- Frontend: HTML5, CSS3, JavaScript, TSX.
- Backend: Node.js
- Database: MongoDB (Compass)
- Hosting: Render for backend and Vercel / Render for frontend.
- Browser-based features: leaflet for geolocation, siren sound, Google recorder for audio and pixel phones, Google Vids

System Components:
- Web Client: Provides SOS UI, acquires geolocation, handles microphone & camera, streams location, triggers siren sound.
- Realtime Server: Accepts location streams stores live coordinates to DB, forwards alerts to emergency contacts.
- Notification Service: Push notifications including a map link and secure evidence links.

Dashboard: Web dashboard for authorities/contacts to view live location and access evidence.

VIII DESIGN CONSIDERATIONS
1. Permission Handling: Browsers require explicit user consent for camera/microphone/location.
2. Chunk-Based Upload: Large video files are broken into chunks to reduce upload failure.
3. Real-Time Location Updates: WebSocket chosen for continuous, low-latency transmission.
4. Data Loss Prevention: Cloud storage ensures that evidence is preserved even in device failure.
5. User Interface Simplicity: Minimal UI helps users activate SOS quickly during panic.
6. Browser Compatibility: Tested on Chrome, Firefox, Edge and mobile browsers.

IX FUTURE ENHANCEMENTS

1. Integration of AI-based scream or violence detection.
2. Automatic detection of sudden fall or motion changes.
3. Developing a Progressive Web App (PWA) for offline caching.
4. Adding multi-language support for accessibility.
5. Adding a police dashboard with heatmaps and incident clustering.
6. Enabling live video streaming instead of chunk-based uploads.
7. Implementing advanced encryption and blockchain- based evidence verification.

X CONCLUSION

In this paper, we have presented **SHEild**, a smart and comprehensive web-based women safety platform designed to offer immediate support and rapid emergency response during critical situations. With the increasing rate of harassment, stalking and physical threats faced by women in both urban and rural environments, there is a strong demand for efficient and easily accessible safety mechanisms. The proposed system addresses this need by integrating various real-time functionalities within a single browser application, eliminating the requirement for additional hardware, mobile installations or GSM modules.

The system begins its operation through a secure long-press activation mechanism which prevents accidental triggering and ensures that the SOS state is initiated only under genuine conditions. Once activated, the platform automatically gathers the user's geolocation at regular intervals and transmits it continuously to the backend for live monitoring. Alongside location tracking, SHEild captures **real-time audio and video recordings** using modern browser APIs, which serve as essential evidence for understanding the nature of the threat. The platform also triggers a **loud, high-decibel siren** to alert surrounding individuals and discourage attackers, while still allowing the victim to choose a silent-mode option if required for their safety.

A significant contribution of this work is the **integration of automated evidence collection and secure cloud storage**. All recorded audio, video and location logs are stored in an encrypted manner to ensure data security, integrity and reliability. The system further notifies the victim's emergency contacts or registered authorities using email or web-based alerts, thereby enabling quick intervention and immediate awareness of the situation. The use of web technologies such as WebRTC, MediaRecorder API, Geolocation API, WebSockets and cloud-based architectures allows the platform to provide these sophisticated features without any dependency on native applications or specialized hardware devices.

The experimental evaluation and methodological design show that the system is capable of providing seamless SOS activation, accurate location updates, smooth media capture, efficient file uploads and reliable notification delivery. By combining all these features under one lightweight, browser- friendly platform, SHEild significantly improves the possibilities for immediate rescue and evidence-based investigation compared to existing solutions which often rely on manual dialing, device-dependent applications or limited- function wearable devices.

Thus, SHEild emerges as a **simple, cost-effective, scalable and user-friendly solution** to enhance women's safety using only a web browser. The system reduces response time, increases situational awareness and provides digital proof that can assist authorities during post-incident analysis. In future enhancements, the platform can be extended by incorporating intelligent audio classification, machine learning-based danger detection, multi-device synchronization and advanced. dashboard capabilities for police departments. Overall, the proposed system holds strong potential to be implemented on a large scale and can play a vital role in safeguarding women through reliable and technology-driven emergency support.

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