



International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 04, April 2026)

FirstResponse: Smart Multi-Mode Emergency Response Application Using Real-Time Location and Volunteer Dispatch

Vinit Thakur¹, Md Kaif², Mohd Maaz Ansari³, Mohd Shahzar Ali⁴, Mohd Saif⁵, Prof. Dr. Satish Kumar Soni⁶, Prof. Dr. Uruj Jaleel⁷

^{1,2,3,4,5}Meerut Institute of Engineering and Technology, Meerut, Uttar Pradesh, India

⁶Head of Department, Professor Meerut Institute of Engineering and Technology, Meerut, Uttar Pradesh, India

⁷Project Coordinator, Professor Meerut Institute of Engineering and Technology, Meerut, Uttar Pradesh, India

Abstract-- In today's fast-paced world, emergency situations such as personal threats, medical crises, and privacy concerns require immediate and efficient response systems. This paper proposes FirstResponse, a smart mobile-based emergency response application designed to address these diverse needs. It features three dedicated emergency modes—Privacy, Security, and Health—allowing users to tailor the response to their specific crisis. The system provides crucial functionality, including real-time location sharing for accurate tracking, alert notifications sent instantaneously to pre-selected trusted contacts, and intelligent routing to direct users or first responders to the nearest appropriate emergency services or pre-vetted volunteers. By integrating advanced geolocation technology, seamless mobile communication, and a robust distributed response mechanism, the proposed system aims to significantly minimize response time and ultimately improve user safety and well-being. The design builds upon the strengths of existing emergency response systems and personal safety applications, incorporating significant enhancements in usability and its unique multi-mode functionality.

Keywords-- Emergency Application, Panic Button, Real-Time Location, Volunteer Dispatch, Personal Safety, Mobile Computing.

I. INTRODUCTION

With the rapid growth of smartphone usage, mobile applications have become essential tools for handling emergency situations. Traditional emergency response systems often suffer from delays and lack of real-time user context. Modern solutions aim to empower users to act as "human sensors" by sending real-time alerts and location data during emergencies [1].

Personal safety applications have gained popularity, especially in scenarios involving crime prevention and medical emergencies. These applications commonly include features such as panic buttons, GPS tracking, and emergency contact alerts [2]. However, most existing solutions focus on a single type of emergency, lacking a unified system that addresses multiple categories such as privacy, security, and health.

In this Paper, FirstResponse is a smart, multi-mode emergency response application. It improves on generic systems by intelligently categorizing emergencies and activating specialized protocols. Utilizing real-time victim location and a network of nearby trained volunteers, FirstResponse aims to significantly reduce response times and enhance the quality of aid across various scenarios like medical crises, fires, and security threats.

II. LITERATURE REVIEW

Several studies have explored mobile-based emergency response systems. Romano et al. [1] highlight the importance of integrating citizens into emergency systems as real-time data providers. Similarly, Just et al. [2] analyze the effectiveness of personal safety apps and identify key features such as panic alerts and live tracking.

Ford et al. [3] conducted a systematic review of mobile safety applications and emphasized their role in preventing interpersonal violence through rapid alert mechanisms. Bowen-Forbes et al. [4] further analyzed safety applications and found that usability, privacy, and accessibility are critical design factors.

Geolocation-based emergency systems have also been widely studied. De Guzman et al. [5] proposed a mobile application integrated with command centers to improve emergency response coordination. Baviskar et al. [6] developed a system that identifies nearby hospitals and police stations using GPS.

Recent research also focuses on volunteer-based emergency response systems. Stroop et al. [8] demonstrated that alerting nearby trained volunteers significantly improves response time in medical emergencies. Similarly, Khalemsky et al. [9] proposed predictive models for efficient volunteer dispatch.

These studies collectively highlight the importance of real-time communication, location tracking, and distributed response systems, forming the foundation of the proposed application.

III. PROPOSED SYSTEM

The proposed system is a **mobile application with three emergency modes**:

3.1 Privacy Emergency Mode

- Sends live location to pre-selected trusted contacts so they can monitor your whereabouts.
- Continuous tracking until the user cancels the alert, ensuring ongoing visibility.
- Designed for situations like stalking or unsafe environments where discreet monitoring is needed.

3.2 Security Emergency Mode

- Shares user's real-time location data with nearby registered volunteers or emergency authorities instantly.
- Displays nearest police stations and other emergency points of contact using the device's integrated GPS.
- Enables rapid broadcasting of an emergency alert and critical details to a wider audience quickly.

3.3 Health Emergency Mode

- Alerts nearby volunteers and medical contacts
- Displays nearest hospitals
- Can include basic medical profile information

The system uses GPS, internet connectivity, and cloud-based services to manage alerts and communication.

IV. SYSTEM ARCHITECTURE

The FirstResponse architecture ensures rapid and efficient emergency response through several interconnected core components:

- *User Interface (Client)*: Simple, intuitive design with three distinct emergency activation buttons (Medical, Fire, Police/General SOS) for quick selection.
- *Location Module (Client)*: Uses real-time GPS data to precisely and continuously track the user's location for accurate dispatch of services or volunteers.

- *Backend Server (Server)*: The central processing hub. It receives/processes alerts, validates requests, initiates response protocols, and manages users and volunteers (authentication, profiles, availability, proximity).
- *Notification System (Server/External)*: A reliable, multi-channel system for timely communication:
 - **SMS**: Alerts contacts and volunteers, especially reliable with poor internet.
 - **Push Notifications**: Instant, context-rich alerts for volunteers and official teams.
 - **Emails**: Detailed reports and formal notifications.
- *Database (Server)*: The persistent storage layer that securely stores:
 - **User Data**: Personal and medical details, emergency contacts.
 - **Logs**: Detailed records of every emergency event, response time, and system activity for audit and improvement.

4.1 The Process:

1. **Trigger (Start & Select)**: The user opens the app and presses one of the three specific emergency buttons (Privacy, Security, or Health).
2. **Capture & Send**: The mobile app immediately grabs the user's precise GPS coordinates and sends that data—along with the type of emergency—to the backend server.
3. **Process & Notify**: The server analyzes the alert, locates the nearest appropriate help (trusted contacts, registered volunteers, or official services like police/hospitals), and immediately pushes notifications to them.
4. **Track & Respond**: While help is on the way, the app continuously streams the user's live location so responders can navigate directly to them.
5. **Resolve**: The process concludes when the user safely stops the alert (or it auto-expires), and the system logs the entire event for future references.

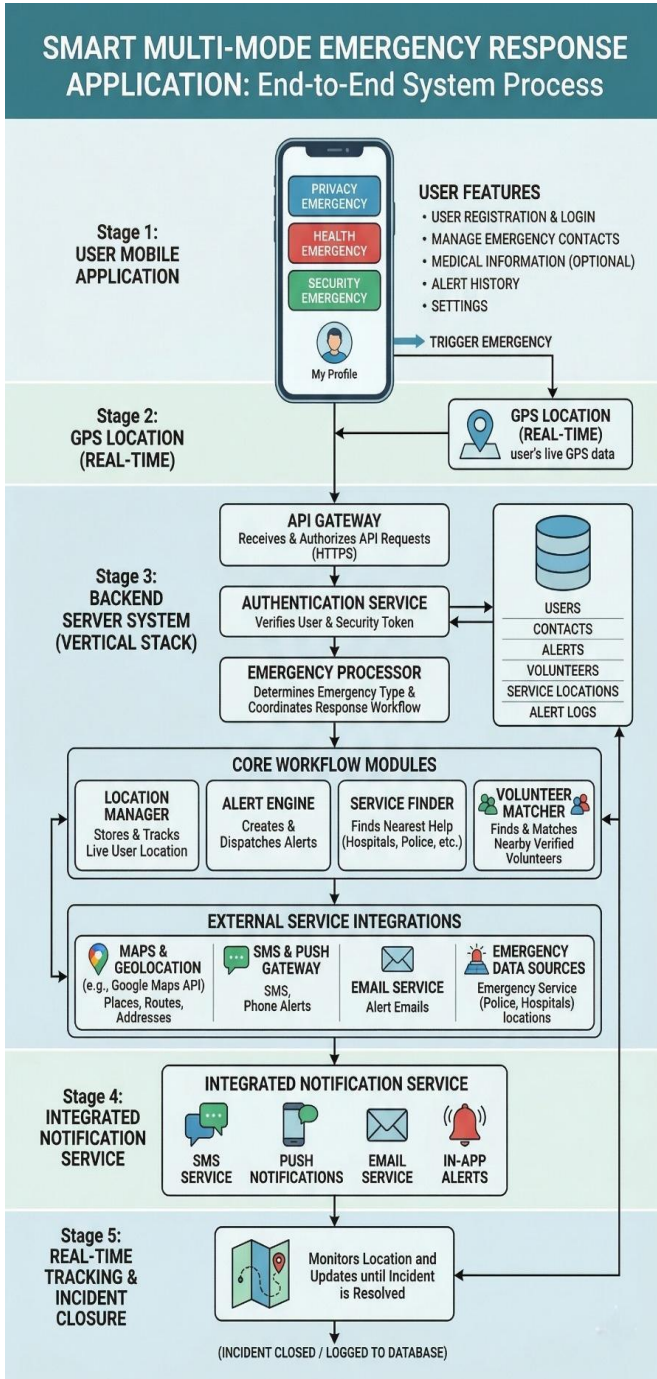


Fig. 1 End to End Process of the system

DESCRIPTION: This flowchart outlines the five-stage end-to-end system process of a Smart FirstResponse: A Multi-Mode Emergency Response Application, detailing the flow from a user triggering an emergency on a mobile app (Stages 1-2), through complex backend processing with data management and core modules (Stage 3), to multi-channel notification dispatch (Stage 4), and concluding with real-time tracking until incident closure (Stage 5).



Fig. 2 Start to End Process Flow

DESCRIPTION: This is an end-to-end process flowchart detailing the nine stages of an emergency response application's lifecycle, from user start to incident resolution.



V. METHODOLOGY

The system follows these steps:

The FirstResponse app provides rapid, multi-faceted emergency assistance using real-time location and a volunteer network.

1. **Activation:** User triggers the in-app emergency button, confirming the need for immediate help.
2. **Location:** System aggressively captures, validates, and continuously updates the user's precise GPS coordinates, refining accuracy with Wi-Fi/cell tower data.
3. **Alert Dispatch:** High-priority alerts with the user's live location are immediately sent to pre-configured emergency contacts (via multiple channels) and broadcast to the nearest, available, and skilled volunteers/responders.
4. **Service Integration:** The system uses mapping APIs to instantly identify and locate the nearest official emergency services (police, fire, hospital) and can initiate communication protocols.
5. **Resolution:** Live tracking and communication continue until the emergency is formally resolved and terminated by the user (via secure authentication) or a designated administrator.

This approach aligns with geolocation-based emergency systems proposed in prior research [5], [6].

VI. ADVANTAGES OF THE PROPOSED SYSTEM

The FirstResponse application is an intelligent, unified platform for emergency management, offering superior user safety and faster assistance by leveraging community resources.

Core Features

- **Multi-purpose Emergency Handling:** A single platform for diverse emergencies (medical, fire, crime, etc.), streamlining the request for help.
- **Faster Response Through Real-Time Tracking:** Advanced location services instantly pinpoint the user's location, providing accurate coordinates and dynamic route guidance to minimize response times.
- **Volunteer-Based Assistance:** A robust network of vetted local volunteers are dispatched immediately to provide life-saving assistance before official responders arrive, ensuring wider geographical coverage.

Enhanced User Benefits

- **Improved Safety and Accessibility:** Features like a simple interface, quick-trigger buttons (e.g., 'shake-to-alert' or panic buttons), and two-way communication ensure help is always accessible and enhance the user's sense of security.

Volunteer-based alerting has been proven effective in reducing response time in emergencies [8].

VII. LIMITATIONS

The "FirstResponse" application faces key technical and operational limitations:

- **Reliance on Stable Internet:** Core functionality is entirely dependent on stable internet. Poor network coverage, especially in rural or disaster-struck zones, severely compromises utility.
- **Limited Integration with Official Emergency Services (911/999/112):** The application lacks seamless, direct integration with official dispatch systems (PSAPs). A separate manual call to the official number may still be required, causing delays.
- **Privacy and Security Concerns (Location Sharing):** Continuous, real-time location sharing raises serious privacy and data security risks. Robust security and adherence to stringent privacy regulations are mandatory to maintain user trust.

Privacy and security remain major concerns in safety applications and must be handled carefully [4].

VIII. CONCLUSION

This paper presents a smart and comprehensive emergency response application that seamlessly integrates crucial features such as privacy, security, and immediate health emergency assistance within a single, unified platform. By strategically leveraging cutting-edge mobile technology, precise real-time location tracking, and an extensive network of dedicated volunteers, the system's core mission is to significantly improve emergency response efficiency and enhance overall user safety and well-being. Future work is focused on crucial integration with official government emergency systems and the development of advanced AI-based predictive response mechanisms.

REFERENCES

- [1] Designing Mobile Applications for Emergency Response: Citizens Acting as Human Sensors (Romano et al., 2016)



International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 04, April 2026)

- **Link:** MDPI Open Access
 - **DOI:** 10.3390/s16030406
- [2] Personal Safety App Effectiveness (Just et al., 2019)
- **Link:** ResearchGate Profile
- [3] The use of mobile phone applications to enhance personal safety and prevent interpersonal violence: A systematic review (Ford et al., 2022)
- **Search Link:** PubMed Search
- [4] Mobile Apps for the Personal Safety of At-Risk Children and Youth: Scoping Review (Bowen-Forbes et al., 2024)
- **Link:** JMIR mHealth and uHealth
 - **DOI:** 10.2196/58127
- [5] Mobile Emergency Response Application Using Geolocation for Command Centers (de Guzman et al., 2014)
- **Link:** Semantic Scholar Profile
 - **PDF:** Direct Download
- [6] Emergency Notification Services Application Design for Mobile Devices (Baviskar et al., 2017)
- **Link:** Research Publish Journals
- [7] Improvement of Emergency Situation Management through an Integrated System Using Mobile Alerts (Repanovici et al., 2022)
- **Link:** MDPI Open Access
 - **DOI:** 10.3390/su142416424
- [8] Mobile phone-based alerting of CPR-trained volunteers simultaneously with the ambulance can reduce the resuscitation-free interval... (Stroop et al., 2020)
- **Link:** PubMed
 - **DOI:** 10.1016/j.resuscitation.2019.12.012
- [9] Predictive Dispatch of Volunteer First Responders: Algorithm Development and Validation (Khalemsky et al., 2023)
- **Link:** Bar-Ilan University CRIS Profile
- [10] Smartphone-activated volunteer responders and bystander defibrillation for out-of-hospital cardiac arrest... (Andelius et al., 2023)
- **Link:** Oxford Academic / European Heart Journal
 - **DOI:** 10.1093/ehjacc/zuac167