

# **Location Based Safety Application for Enhancing Women's Safety**

**This project report is submitted to  
Government College of Engineering, Chandrapur  
(An Institution Affiliated to Gondwana University, Gadchiroli)  
In partial fulfilment of the requirement  
For the award of the degree  
Of  
Bachelor of Engineering in Computer Science and Engineering**

**Submitted by**

Mansi Bambode

Rohit Farkade

Mohammad Gaznavi Sheikh

Uzma Jabeen Syed Raza Ali

Manish Walurkar

**VIII Sem B.E. (CSE)**

**Under the guidance of**

Prof. Rekha Sahare



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**GOVERNMENT COLLEGE OF ENGINEERING**

**(An institution affiliated to Gondwana University Gadchiroli)**

**CHANDRAPUR – 442 403**

**2024-2025**

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CHANDRAPUR – 442 403  
2024-2025**

## CERTIFICATE OF APPROVAL

Certified that the project report entitled "***Developing a flutter application to enhance women's safety: shield sisters***" has been successfully completed by **Mansi Bambode, Rohit Farkade, Mohammad Gaznavi Sheikh, Uzma Ali, Manish Walurkar** under the guidance of **Prof. R. K. Sahare** from Department of Computer Science and Engineering in recognition to the partial fulfilment for the award of the degree of Bachelor of Engineering in Computer Science and Engineering, **Government College of Engineering, Chandrapur (An Institution Affiliated to Gondwana University, Gadchiroli).**

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Date of Examination:

## **DECLARATION**

We certify that

- a. The work contained in this project has been done by me under the guidance of my supervisor(s).
- b. The work has not been submitted to any other Institute for any degree or diploma.
- c. We have followed the guidelines provided by the Institute in preparing the project report.
- d. We have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.
- e. Whenever we have used materials (data, theoretical analysis, figures, and text) from other sources, we have given due credit to them by citing them in the text of the report and giving their details in the references. Further, we have taken permission from the copyright owners of the sources, whenever necessary.

**Name of students**

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## ABSTRACT

In a world where women's safety remains a pressing concern, particularly in urban and semi-urban areas, the need for effective and responsive safety solutions has become increasingly vital. Shield Sisters is a mobile-based application designed to provide a proactive approach to women's safety by integrating real-time alert systems, live tracking, community support, and direct communication with family members and closed ones. The background of this research stems from the persistent rise in incidents of harassment, violence, and delayed emergency responses, highlighting the gap in existing safety infrastructures.

The core objective of this project is to investigate how technology can be leveraged to bridge the communication gap between women in distress and their support systems, including family, nearby users, and law enforcement. The problem addressed centers on the lack of centralized, rapid-response mechanisms that can not only alert but also track, zone, and communicate in real-time during emergencies.

To develop an efficient and user-friendly system, we adopted a multidisciplinary methodology combining mobile application development (using Flutter (Dart)), backend integration (with Node.js and MongoDB), geolocation APIs for live tracking, and community-based communication modules. The app includes key features such as an SOS alert system, live GPS tracking, SMS alerts to predefined contacts, messaging like community alerts to with nearby users, and direct contact with the nearest police station.

Our findings suggest that the Shield Sisters application significantly enhances the sense of security and speed of emergency response for women users. It also introduces a new dimension to community-supported safety networks and technology-assisted zoning for crime-prone areas. The implications of this project extend to policy-makers, NGOs, law enforcement, and developers who are striving to create safer urban ecosystems.

Serving as a "shop window" to this research, the Shield Sisters app not only demonstrates the potential of combining AI and geolocation technology for public safety but also provides a scalable model for other safety-focused applications. Readers interested in gender-centric technology, smart city safety, and real-world mobile solutions will find this research highly relevant and impactful.

# **CHAPTER 1**

## **INTRODUCTION**

## 1.1 PROJECT BACKGROUND

Women's safety is one of the most serious concerns in today's world, especially in countries like India. Despite laws and police efforts, crimes like harassment, violence, and abuse against women are still increasing. As per the National Crime Records Bureau (NCRB), over '4 lakh' cases of crimes against women were reported in 2021. These numbers show that there is still a major gap between law enforcement and the actual safety that women experience every day.

The idea of the Shield Sisters app came from this serious issue—the lack of a fast and connected system to help women during emergencies. Many mobile apps and helplines exist, but they often fail because of slow response times, no real-time tracking, poor links with police, or little help from nearby people. In many cases, women tried calling or posting for help but didn't get timely support due to location issues or delays. This shows the need for a **real-time, tech-based solution** that does more than just send alerts—it should act as a **complete safety system**.

Technology has brought many useful tools for public safety, like GPS tracking, push notifications, mobile apps, cloud storage, and even AI-based alerts. However, most current safety platforms either only focus on sending alerts or rely too much on internet or police response, without involving the nearby community to help.

The Shield Sisters app tries to solve these problems by combining multiple safety features into one easy-to-use mobile platform. It includes:

1. **SOS alerts** that send messages and location to trusted contacts
2. **Live GPS tracking** to share the real-time location
3. **Community communication** to alert nearby users
4. **Area zoning** to detect unsafe areas
5. And **direct connection with police** to get faster help.

This project is more than just an app—it is a social step forward. It aims to empower women, make communities safer, and help the police respond better in emergencies. By using real-time data, location tracking, and community help, Shield Sisters brings a fresh and effective way to improve women's safety in the digital age.

## 1.2 PROBLEM STATEMENT

Women's safety is a growing concern due to rising cases of harassment, assault, and violent crimes. A major challenge in such situations is the delay in communication and response, often leading to severe consequences. Existing safety measures, such as helplines and GPS tracking apps, lack a quick and coordinated response system. Many women struggle to seek help due to panic, network issues, or inaccessibility.

The **Shield Sisters** mobile app addresses this gap by providing a real-time safety solution with features like instant alerts, live tracking, geofencing, and community support. It ensures immediate communication with pre-registered contacts, authorities, or nearby users, enhancing emergency response efficiency.

### Key Features & Innovation

1. **Real-Time Safety Solution:** Enables instant alerts and live tracking to provide immediate protection.
2. **Advanced Technology:** Built with Dart, MongoDB, Node.js, and Twilio for seamless and secure communication.
3. **Comprehensive Security Network:** Integrates authentication, emergency alerts, area zoning, and real-time monitoring.
4. **Scalability & Practicality:** Can be used in different situations of emergencies to help women and keep them safe.
5. **Community Empowerment:** Fosters a collective responsibility approach, ensuring women feel secure and independent.

The **Shield Sisters** app is more than just a safety tool—it's a proactive platform that empowers women through technology, ensuring help is always within reach.

### **1.3 PURPOSE OF STUDY**

The fundamental aim of this study is to contribute a practical, technology-driven solution to one of the most challenging social concerns—ensuring women's safety in real-world scenarios. Unlike existing discussions that focus solely on the presence of threats or failures in safety mechanisms, this study focuses on proactive, user-centric innovation that enhances personal security through mobile-based tools.

This project does not merely examine the issue of women's safety from a theoretical standpoint; instead, it explores how mobile technology can be translated into action by creating an integrated, feature-rich application that serves as both a personal alert system and a safety companion.

Rather than duplicating existing approaches, this study proposes a multifunctional model—Shield Sisters—that brings together geolocation intelligence, community alert systems, and rapid communication with emergency responders. By doing so, it seeks to test how real-time data and peer networks can bridge the gap between danger recognition and help delivery.

This study is directed by three core purposes:

**1. To explore how mobile technology can be repurposed to respond instantly during safety threats.**

The app aims to empower users to act swiftly without relying solely on traditional emergency methods like phone calls or police helplines.

**2. To determine whether integrating community-based responses can significantly reduce response time in emergencies.**

Most apps today lack a localized human network; this study evaluates the value of involving nearby users in distress response.

**3. To assess how multi-level integration (user contacts, community members, and law enforcement) can lead to better safety outcomes.**

It tests whether combining these layers can create a dependable ecosystem for crisis handling, beyond just alerting or tracking.

This purposeful exploration and system development aim to inspire further research and development in the field of tech-enabled public safety, not just for women but for all vulnerable groups.

## **1.4 TECHNOLOGICAL BASE**

The Shield Sisters is developed using a combination of modern technologies to ensure security, efficiency, and scalability. Below is a detailed breakdown of the technologies:

### **1. Flutter (Frontend Development)**

Flutter is an open-source UI framework developed by Google, allowing the application to run smoothly on Android devices. It provides a single codebase for multiple platforms, ensuring high performance and a responsive user interface. The framework's rich set of widgets enables the creation of an intuitive and user-friendly experience, making it easy to access.

### **2. Node.js and Express.js (Backend Development)**

Node.js is a highly scalable and efficient runtime environment used for handling server-side operations. It is known for its event-driven architecture, making it ideal for processing multiple requests simultaneously. The backend manages authentication, alert generation, database queries, and communication with external APIs, ensuring real-time data flow between users.

### **3. MongoDB (Database Management)**

MongoDB is a NoSQL database used for secure and scalable data management. It efficiently stores user profiles, emergency contacts, alert logs, and location data. The database ensures fast retrieval of information, making real-time tracking and notifications seamless. Its flexible document structure allows easy scalability as the app grows.

### **4. Twilio (Cloud-Based Communication Service)**

Twilio is integrated into the application to enable real-time emergency communication. It provides SMS alerts, automated voice calls, and push notifications to inform emergency contacts instantly. Twilio's cloud infrastructure ensures reliable message delivery, even under high-traffic conditions, making it an essential component of the app's alert system.

### **5. Google Maps API (Live Location Tracking & Area Zoning)**

Google Maps API is used to implement live GPS tracking and area zoning features. It helps in real-time monitoring of the user's location, allowing emergency contacts to track movement. The feature alerts users when they enter unsafe areas, enhancing preventive safety measures.

## **6. Firebase Database (User Authentication & Security)**

Firebase Authentication is used to manage secure login and user verification. It provides multiple authentication methods, including email and phone number verification, ensuring that only verified users can access the app. This enhances security and prevents unauthorized access. In addition to authentication, Firebase is also used for real-time communication within the app, enabling instant data syncing and seamless interactions between users, which enhances the overall responsiveness and user experience.

## **7. Vercel**

Vercel helps us deliver the Shield Sister application efficiently by providing a seamless and reliable platform for deployment. It enables quick and easy deployment directly from our code repository, ensuring that every update is automatically built and deployed with minimal effort. With its continuous integration and delivery (CI/CD) capabilities, Vercel ensures that the latest changes are always live and accessible. Additionally, Vercel offers global content delivery through its built-in CDN, which helps the Shield Sister application load quickly for users around the world. Features like automatic scaling and performance optimization further enhance the user experience, making Vercel an ideal choice for hosting and managing the Shield Sister web application.

By integrating these advanced technologies, The Shield Sisters offers a powerful, real-time safety solution that ensures quick response, efficient tracking, and secure communication.

## **1.5 OBJECTIVES**

The **Shield Sisters** project aims to enhance women's personal safety by leveraging mobile technology. With limitations in existing support systems, this study proposes a practical and accessible mobile-based solution. The following objectives guide the design, development, and implementation of the system.

### **Primary Objective:**

To develop a comprehensive mobile application that provides immediate, reliable, and user-friendly tools for women during emergency situations.

### **Specific Objectives:**

#### **1. To implement a one-tap emergency alert mechanism:**

Integrate a quick-access SOS feature that sends the user's real-time location and predefined message to selected contacts.

#### **2. To enable real-time location sharing and monitoring:**

Use GPS and mapping services to allow trusted contacts and authorized personnel to track the user's location during critical times.

#### **3. To facilitate community-based support through proximity alerts:**

Develop a feature to notify nearby users within a defined radius when an alert is triggered, promoting community involvement.

#### **4. To identify and visually mark risk-prone areas:**

Include a zoning system that marks locations based on user input or reports, assisting users in navigating more safely.

#### **5. To streamline communication with law enforcement agencies:**

Add functionality for direct contact with local authorities or emergency services to reduce response time.

#### **6. To store and manage user data securely:**

Ensure robust data protection through encryption and user authentication to safeguard personal and contact information.

#### **7. To develop an intuitive and accessible user interface:**

Design a responsive and user-friendly interface suitable for users of varying age groups and technological familiarity, especially during high-pressure situations.

## **CHAPTER 02**

### **LITERATURE SURVEY**

## 2.1 Related Work

### 1. Existing Women's Safety Applications & Their Limitations

Several mobile applications, such as **bSafe**, **My Safetipin**, and **Himmat**, have been developed to enhance women's safety. For example, the Delhi Police's *Himmat* app includes a panic button and real-time GPS tracking, but its dependency on active police monitoring has raised concerns over responsiveness and scalability.

Similarly, *bSafe* offers live streaming, automatic recording, and fake call options. However, most of these applications face limitations in user engagement, offline support, or lack of community-based interaction. These apps offer features like GPS tracking, emergency SOS alerts, and location sharing. However, significant limitations have been identified:

- **App Inactivity in Locked State:** Many safety apps pause in the background if the phone is locked, delaying emergency alerts.
- **Internet Dependency:** Most applications require an active data connection, making them unreliable in low-network or rural areas.
- **Limited GPS Accuracy:** Many apps fail to provide precise location tracking, especially in densely populated areas, leading to delays in assistance.
- **Lack of Multi-Language Support:** Existing solutions primarily operate in English or major regional languages, limiting accessibility for diverse user groups.
- **Limited Community Participation:** Many apps focus solely on emergency services rather than engaging nearby users or volunteers for faster response.

### 2. Technologies Used in Safety Solutions

Research in mobile technology for personal safety has revealed an increase in public reliance on smartphones as a first point of response during emergencies. Studies show that **user behavior during distress situations is often dictated by ease of access, speed of response, and social visibility** of safety tools. According to literature, applications with minimal steps to initiate help are more likely to be used effectively during crises.

To enhance safety applications, various technologies have been implemented:

- **GPS & Geofencing:** Used for real-time location tracking, but often struggles in urban congestion or remote areas.
- **Cloud-Based Communication (Twilio, Firebase):** Facilitates instant SMS, calls, and push notifications, ensuring quick alerts to emergency contacts.
- **Background Services & Automation:** Some applications use Android background services, but due to OS restrictions, apps may pause when the phone is locked.

- **AI & Machine Learning:** Few applications integrate AI-driven threat detection or predictive analysis for high-risk areas.
- **Multi-Language Accessibility:** Most applications lack support for diverse languages, restricting usability among non-English speakers.

### **3. Community-Based Safety Initiatives Research**

The concept of **community-led safety** has been studied in both physical and digital formats. Offline models include neighborhood watch programs, while online initiatives have evolved through platforms such as WhatsApp safety groups and geo-fenced alert systems. Academic findings suggest that when communities are involved in safety, **response times improve and crime deterrence increases**, especially in decentralized policing environments.

Technology has become a crucial enabler for real-time community engagement. The Shield Sisters app builds upon this research by incorporating features that notify nearby users in case of emergency, transforming passive app users into active safety collaborators. This innovation is particularly relevant in regions where immediate institutional response is limited or delayed.

### **4. Gap Analysis & Justification for The Shield Sisters**

While significant strides have been made in mobile safety applications and community-driven security frameworks, **key gaps remain** in the integration of multiple protective layers within a single platform. Few applications offer a complete solution that includes user alerts, community participation, area intelligence, and direct police interaction.

Based on the identified limitations, The Shield Sisters aims to provide a more reliable, accessible, and efficient safety solution:

- **Works in the Background:** The app ensures that emergency alerts can be triggered even if the phone is locked or in standby mode.
- **Accurate GPS Tracking:** The app uses enhanced GPS algorithms and geofencing to improve location accuracy in crowded areas.
- **Community Engagement:** Integrates community-driven safety networks, ensuring that local volunteers or authorities can assist faster in emergencies.
- **Focus on Rural & Less Populated Regions:** Designed to work in low-network areas, expanding safety solutions beyond urban centers .

By addressing these critical gaps, The Shield Sisters emerges as a more effective and inclusive safety solution, ensuring that help is always within reach, regardless of connectivity or location constraints.

**CHAPTER 03**

**SOFTWARE REQUIREMENT SPECIFICATION**

### **3.1 Purpose**

The purpose of **Shield Sisters** is to enhance women's safety by providing a real-time emergency response system through instant alerts, live location tracking, and community support. By integrating advanced technology, the app ensures quick communication with trusted contacts and authorities, reducing response time in critical situations. It aims to create a safer environment where women feel secure, empowered, and supported, whether commuting, traveling alone, or facing distress.

#### **3.1.1 Document Convention**

The document has used underlined words to highlight the user requirements. It also uses capital lettered words to highlight key words. The document has tried to maintain a priority of requirements. Priority of higher-level requirements is inherited by detailed requirements. The document has used short forms for some commonly abbreviated terms.

#### **3.1.2 Intended Audience and Reading Suggestions**

The document is intended to be a guide for developers, users and testers. The goal of this document is to identify the requirements of application. A developer may directly want to know the requirements by reading the section of **USER REQUIREMENTS** and skipping other sections if required.

#### **3.1.3 Product Scope**

##### **❖ Purpose**

- Provides real-time emergency alerts and live location tracking for quick response.
- Integrates geofencing to identify and notify users about high-risk areas.
- Supports instant communication via SMS, voice calls, and push notifications using Twilio.
- Ensures secure data management with authentication and encrypted storage.
- Scalable for use in law enforcement, workplaces, universities, and public transport systems.

##### **❖ Benefits**

- Ensures quick alerts to trusted contacts and authorities, reducing response time.
- Provides real-time location tracking and geofencing for proactive protection.

- Encourages collective responsibility for women's safety through a network-driven approach.
- Designed with an intuitive interface for easy emergency activation, even in panic situations.
- Can be adapted for various environments, including public transport, workplaces, and universities.

## 3.2 Overall Description

### 3.2.1 Product Perspective

Shield Sisters is a mobile safety application designed to provide an integrated and proactive solution for women's security. Unlike traditional safety apps that focus solely on GPS tracking or helplines, this app combines real-time alerts, live tracking, geofencing, and community-driven support to ensure immediate assistance. It leverages cloud-based infrastructure, secure authentication, and advanced communication tools to offer a reliable and efficient emergency response system. Designed for scalability, the app can be adopted by individuals, law enforcement agencies, universities, and public transport systems, making it a versatile and impactful safety solution.

### 3.2.2 Product Functions

- **Emergency Alert System** – Sends instant distress alerts to pre-registered contacts, authorities, or nearby users.
- **Geofencing & Safety Zoning** – Notifies users about high-risk areas and restricted zones for enhanced precaution.
- **Secure User Authentication** – Ensures data protection with login authentication and encrypted storage.
- **Multi-Channel Communication** – Uses SMS, voice calls, and push notifications via Twilio for instant emergency alerts.
- **Scalable & Adaptable Design** – Can be implemented in workplaces, universities, public transport, and law enforcement.

### **3.2.3 Operating Environment**

<b>Processor</b>	1.8 GHZ or more
<b>RAM</b>	2 GB RAM
<b>Hard Drive</b>	1 GB Space
<b>Internet Connection</b>	YES (4G, 5G & more)

### **3.2.4 Design and Implementation Constraints**

#### **❖ Hardware Constraints**

The Shield Sisters application requires Android devices running version 10 or above, with GPS, internet connectivity, and sufficient storage capacity for smooth operation. It depends on mobile sensors such as location services and motion detection, making it less effective on devices with outdated hardware or limited processing power. Additionally, prolonged use of real-time tracking may impact battery life.

#### **❖ End-User Constraints**

Users must have an active internet connection for real-time updates and notifications. In areas with weak network coverage, alerts may experience slight delays. The app also requires location permissions and background tracking, which some users may hesitate to enable due to privacy concerns. Additionally, users must register emergency contacts in advance to ensure effective alert delivery.

## **3.3 System Features**

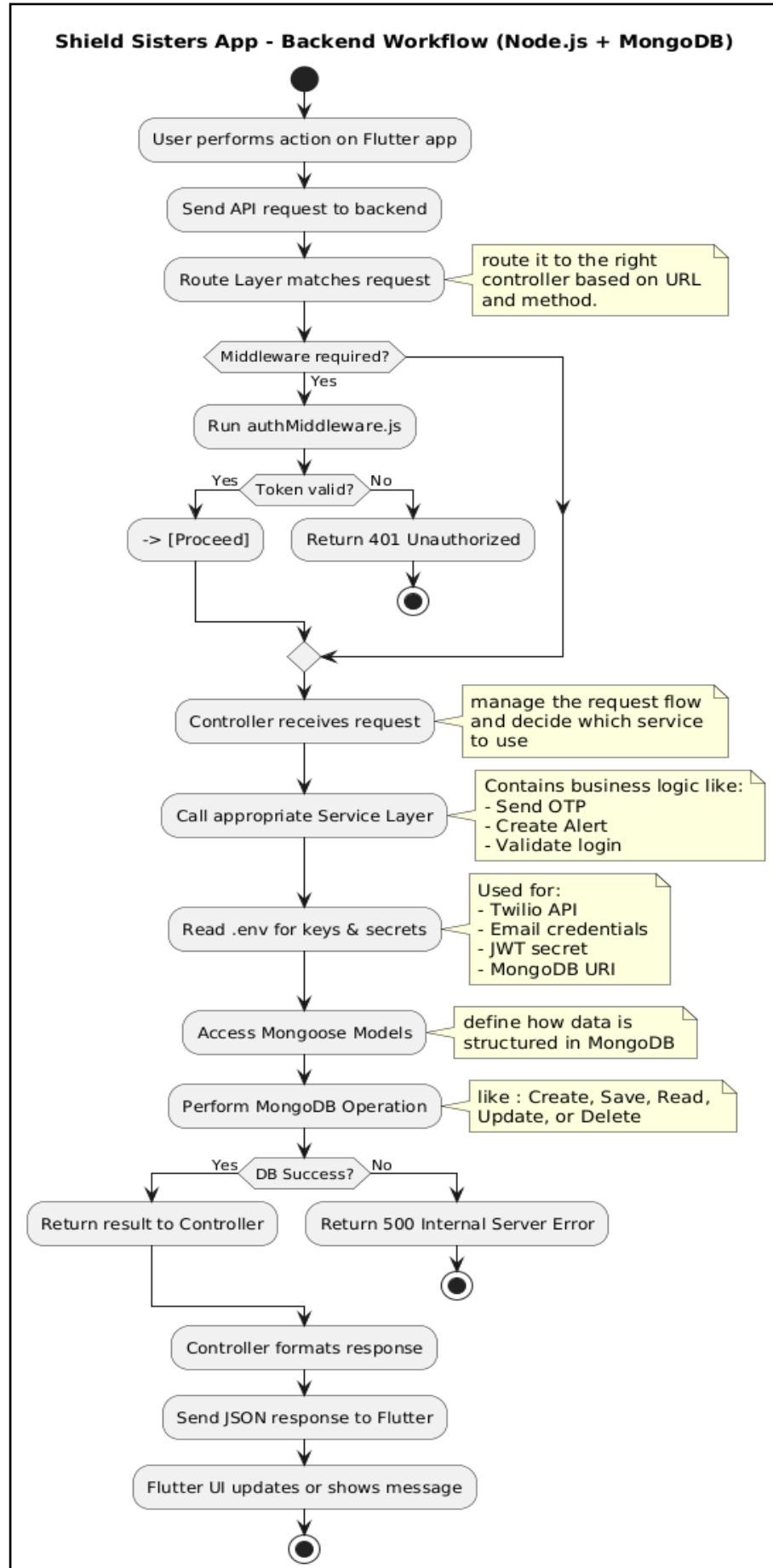
The **Shield Sisters** application is divided into different modules, each responsible for specific safety functions. All modules are integrated to ensure a seamless and efficient emergency response system. These modules provide various features of the system.

- Login/Register Module
- Homepage
- SOS Alert System
- Real-Time Location Tracking
- Safety Zoning
- Notification
- Settings & User Preferences

**CHAPTER 04**

**SYSTEM DESIGN**

## 4.1 Database Diagram



**Fig.4.1:Database Flowchart**

## 4.2 System Design

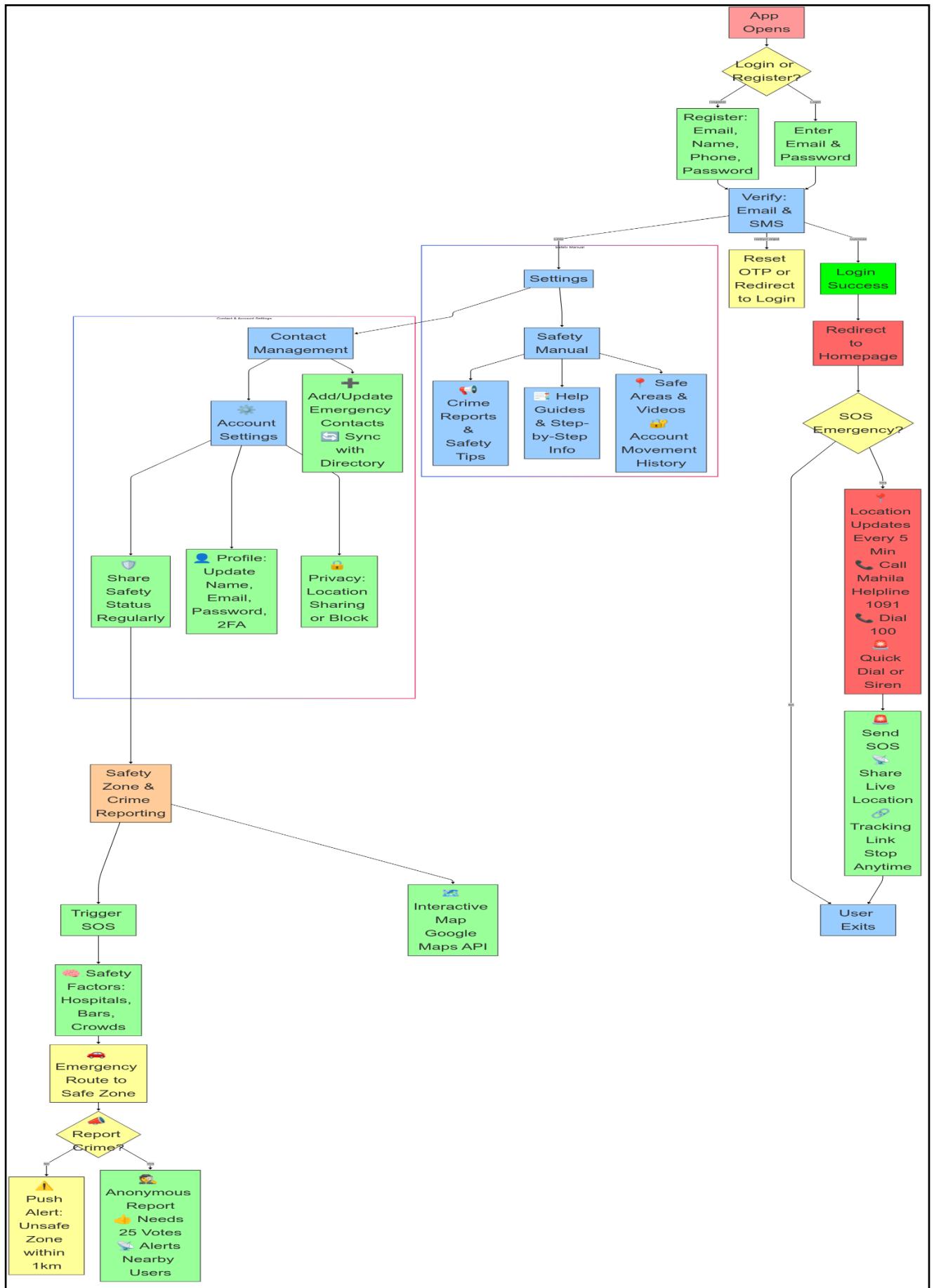
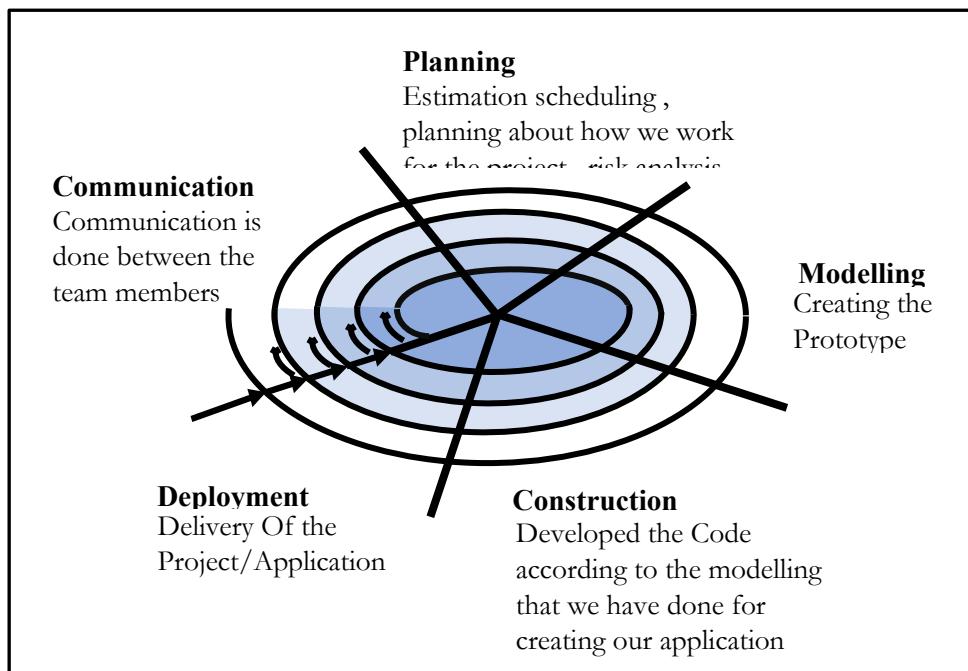


Fig.4.2:System Design

### 4.3 Spiral Model



**Fig.4.3:Spiral Model**

Team followed the Spiral Model to manage the design and implementation of our mobile application. This model supported our need for iterative development, risk mitigation, and continuous improvement. Below is a breakdown of how we collaborated and managed our work through each phase:

#### 1. Communication

Effective communication formed the backbone of our project. We conducted regular team meetings over Google Meet to discuss requirements, resolve blockers, and review progress. These included:

- Sprint planning sessions at the start of each cycle
- Daily stand-ups for task updates and issue tracking
- Sprint reviews and retrospectives after each loop

This helped us maintain transparency, minimize miscommunication, and stay aligned with project goals.

#### 2. Planning

In the planning phase of each Spiral loop, we collaboratively estimated effort, identified risks, and assigned tasks. We created and tracked team's work, breaking them into sprints with achievable goals. Each team member contributed to:

- Time estimation based on their area of work (frontend, backend, UI/UX)
- Identifying dependencies and bottlenecks
- Deciding on feature priorities and deadlines

This collective planning ensured we had a clear roadmap and minimized surprises during implementation.

### 3. Modelling

During modelling, team worked closely to create wireframes, user flows, and system diagrams. We used:

- Figma for UI/UX design
- Draw.io for system flow diagrams and component architecture
- UML diagrams to visualize interactions between modules

These models helped us structure the Flutter mobile app, ensuring consistency in user experience and system behaviour. Regular feedback from all team members refined these models before development began.

### 4. Construction

In the construction phase, we began implementation:

- Mobile app: Developed in Flutter with Dart, along with building technologies like Next.js and deployed via Vercel.
- Backend & Authentication: Handled by Firebase Firestore, Firebase Auth, and Cloud Functions
- GitHub for version control and followed Git Flow branching strategies. Each feature branch underwent:
  - Peer code reviews using GitHub pull requests
  - Continuous Integration (CI) workflows for quick feedback

The whole team collaborated continuously to ensure the app matched the intended design and functionality.

### 5. Deployment

For deployment and testing, we set up a pipeline for application:

- The Flutter app was tested using emulators and real devices, then released via internal testing tracks
- Firebase was used for backend deployment, authentication, and hosting of dynamic data

Before each deployment, we used deployment checklists, ran test cases, and had rollback plans in place in case of errors. Our team coordinated these efforts to ensure smooth and timely releases.

## **6. Iterative Refinement in Spiral Loops**

After each development cycle, we held retrospective meetings to reflect on:

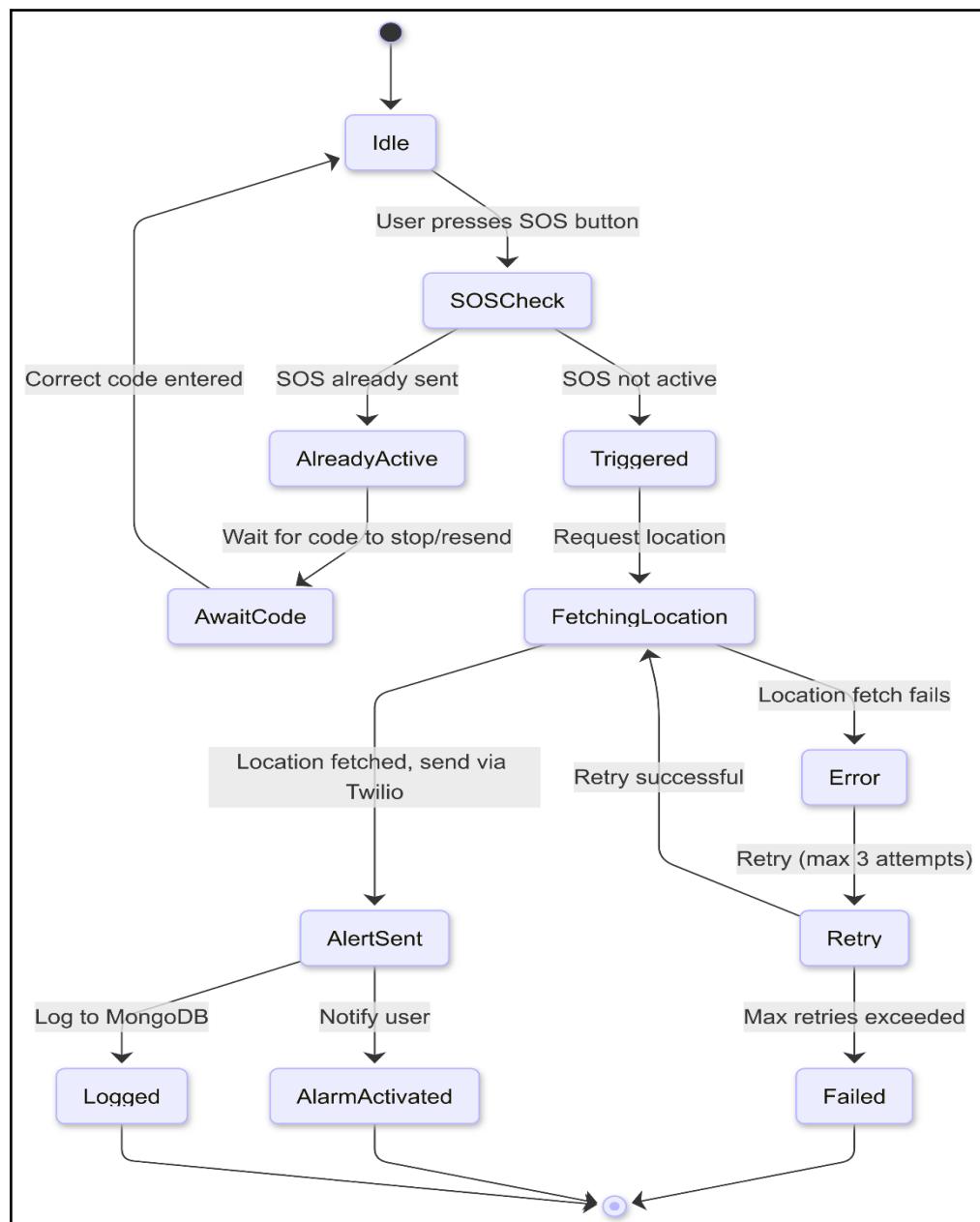
- What worked well (e.g., efficient code review process, strong UI feedback loop)
- What needed improvement (e.g., build time optimization, clearer sprint goals)

These insights shaped the next iteration, allowing us to incrementally improve both the product quality and team dynamics. The Spiral Model's focus on feedback and refinement helped us stay flexible and responsive to change.

Through this structured yet adaptive process, we were able to effectively build a cross-platform application with robust backend integration and user-centric design. The collaborative spirit across every stage—communication, planning, modelling, construction, and deployment—ensured we delivered a functional, scalable, and secure app using modern tools and technologies.

#### 4.4 State Diagram

The state diagram is illustrating the workflow of an SOS alert system. It starts from the Idle state, where the user can press an SOS button, triggering a check on whether an SOS has already been sent. If already active, it waits for a code to stop or resend; if not, it proceeds to FetchingLocation. After successfully fetching the location, the system sends it via Twilio, logs it to MongoDB, and notifies the user. In case of location fetch failure, the system retries up to three times before moving to a Failed state. The diagram ensures all states lead to a final outcome: AlarmActivated, Logged, or Failed.



**Fig.4.4:State Diagram**

#### 4.5 Sequence Diagram for SOS

The diagram illustrates the sequence of interactions in an SOS alert system involving a user, mobile app, and various backend services. When the user triggers an SOS, the mobile app obtains the user's location via the Google Maps API and sends an alert request to the Node.js backend. The backend uses the Twilio API to send an SMS alert and logs the SOS event in Firebase. Firebase confirms the log, and the system also updates the location, confirming each step. Finally, the mobile app informs the user that the alert has been sent and activates an alarm, ensuring a complete and responsive emergency alert flow.

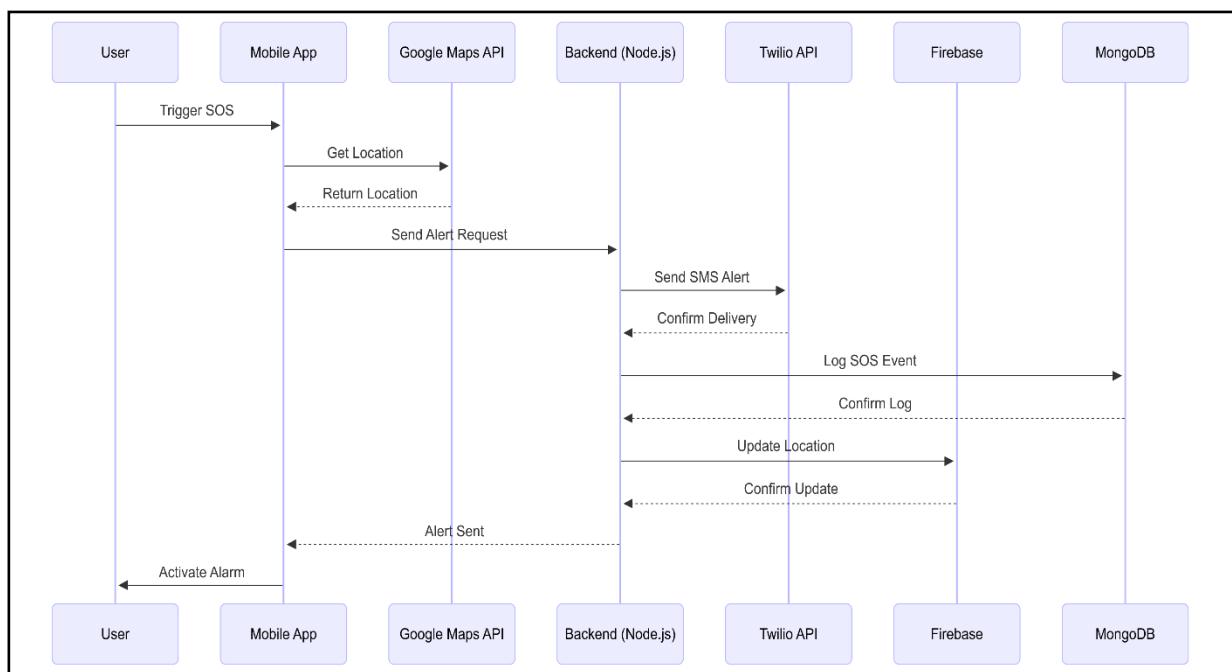


Fig.4.5:Sequence Diagram for SOS

**CHAPTER 05**

**DESIGN AND IMPLEMENTATION**

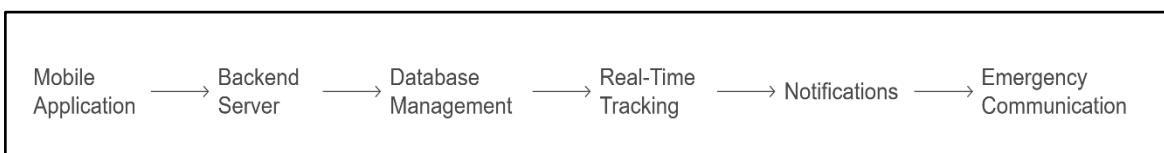
## 5.1 System Architecture

The architecture of Shield Sisters is strategically designed to offer real-time safety support, dependable data handling, and seamless communication between users, emergency contacts, and backend services. Operating on a client-server framework, the mobile application connects with a centralized backend, a secure database, and various third-party APIs. This integrated setup powers essential features such as SOS emergency alerts, live location tracking, geofencing notifications, and secure user authentication.

### System Components

Shield Sisters is a comprehensive safety platform composed of several interconnected modules, each designed to perform specialized functions that collectively ensure user safety and system reliability.

- ✓ **Mobile Application (User Interface):** Built using Flutter, the mobile app supports both Android, offering a seamless cross-platform experience. It handles user interactions, SOS activation, live location sharing, and displays geofencing alerts on an interactive map.
- ✓ **Backend Infrastructure:** Developed with Node.js, the backend system manages authentication processes, handles user data requests, and coordinates API communications. It ensures secure and reliable data exchange between components. The system uses Express.js, a lightweight and flexible web framework, to build RESTful APIs and efficiently organize routes and middleware for features like SOS alerts, friend requests, and user management.
- ✓ **Database System:** MongoDB acts as the central database, storing critical user information such as login credentials, emergency contacts, SOS event logs, location history, and geofence configurations. The database is optimized for fast access and complies with strict security protocols.
- ✓ **Live Tracking & Notifications:** Real-time location updates are powered by Firebase Firestore, enabling trusted contacts to track users in emergencies. Firebase Cloud Messaging (FCM) facilitates prompt push notifications, keeping users and their emergency circle informed at all times.
- ✓ **Emergency Alert Mechanism:** Twilio API integration allows the system to send immediate SMS alerts during SOS events, ensuring vital information reaches trusted contacts — even in low connectivity zones — for maximum outreach and response efficiency.



**Fig.5.1: System Components**

## 5.2 Secure Login System

The Shield Sister login system features Login and Register pages integrated with MongoDB for data storage and verification. Users register by providing name, email, phone, password, and optionally, an address. A random OTP is sent to the user's email via NodeMailer for secure verification. Registration completes only after correct OTP entry; failure requires restarting the process.

For returning users, the login page validates email and password against MongoDB. Upon success, a JWT is issued for session management. Expired JWTs trigger automatic logout. Passwords are securely encrypted in the database to ensure data privacy.

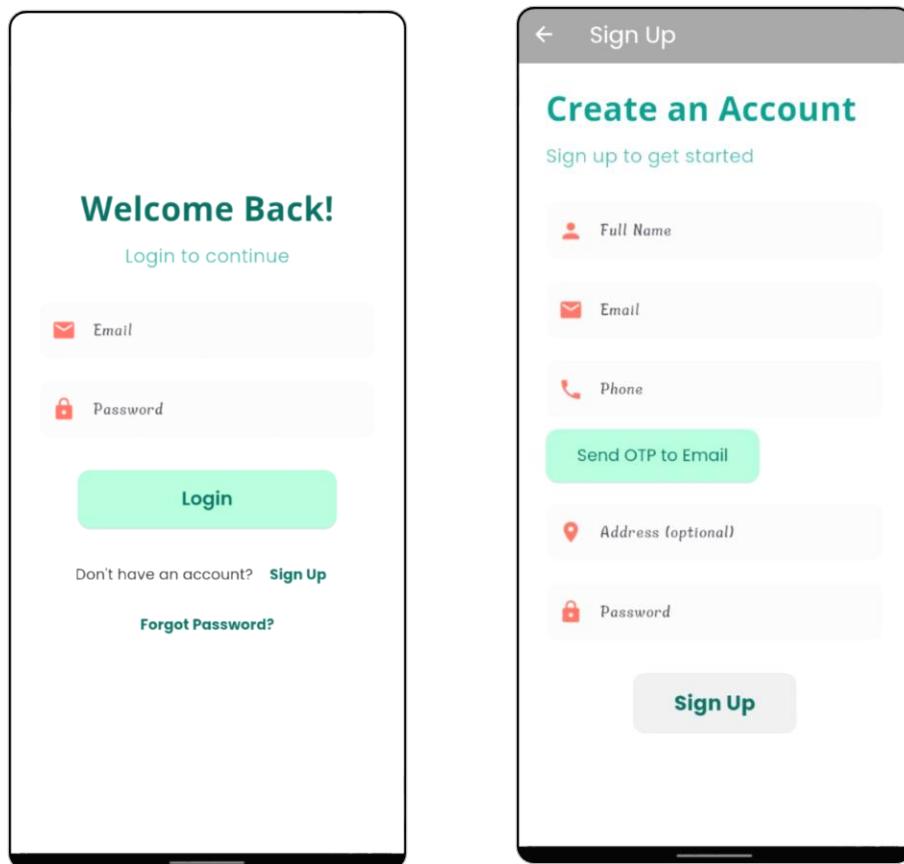


Fig.5.2.a:  
Login Page

Fig.5.2.b:  
Register Page

### 5.3 SOS Alert System

The SOS alert system in the Shield Sister app is a vital emergency feature, activated after users add emergency contacts through a friend request process. Once accepted, the SOS function becomes available.

It includes three main components:

1. **User Data Collection:** On triggering SOS, the system gathers data such as battery level, network strength, ringer mode, GPS location, and timestamp, all stored securely in MongoDB.
2. **SMS & Notifications:**
  - Twilio API sends emergency SMS to registered contacts.
  - Two alerts are triggered:
    - **SMS Notification** with a loud siren
    - **In-App Notification** with live location and a safety code
3. **Live Tracking & Code Verification:** Recipients can track the sender in real-time. The SOS alert deactivates only when the sender enters the correct safety code, confirming their safety.

This ensures reliable, secure, and context-rich communication during emergencies.

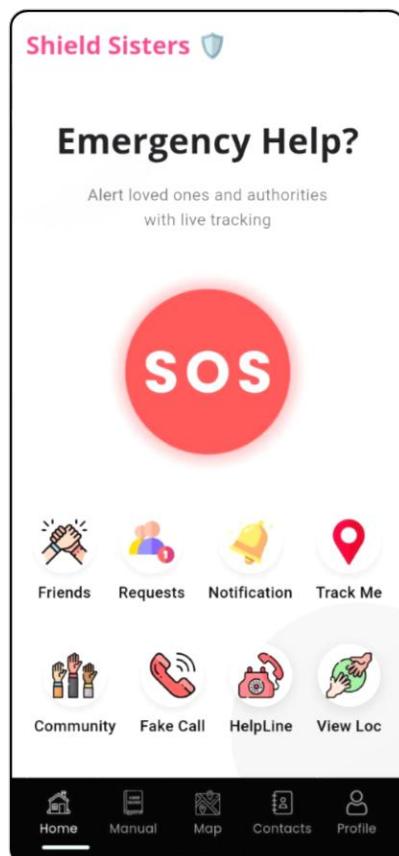


Fig.5.3.a:  
SOS Home Page

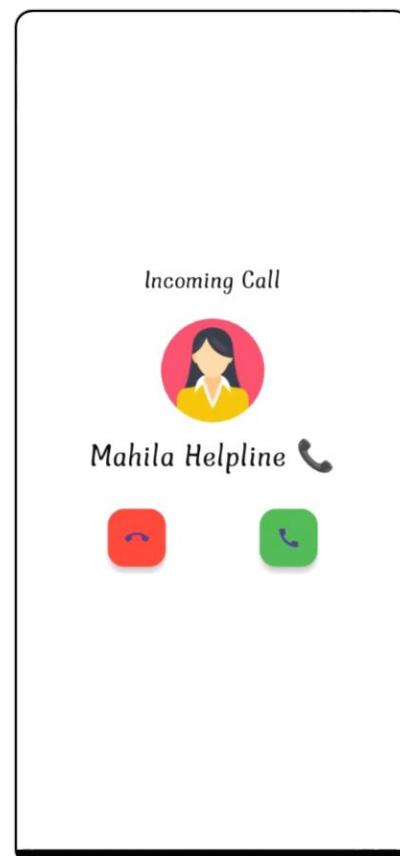


Fig.5.3.b:  
Fake call Page

## 5.4 Location Page

The Location/Map Page in the Shield Sister app combines safety-driven features like Area Zoning, Incident Reporting, and Safe Zone Navigation, powered by the Google Maps API with secured API access via environment variables.

### Key Features:

#### 1. Area Zoning:

- **Red Zones:** Mark risky areas (e.g., bars, crime-prone spots).
- **Green Zones:** Indicate safe areas (e.g., hospitals, police stations).
- Zones render only within a **5 km radius** for performance.
- Future enhancement: a **Location Safety Score** based on reports and historical data.

#### 2. Incident Reporting:

- Users tap the map, describe the incident, and report it.
- Helps alert others and crowdsources safety data.

#### 3. Safe Zone Navigation:

- Users get directions to nearby Green Zones during emergencies.
- Enables quick and safe rerouting.

This feature-rich map interface supports real-time safety awareness and response.

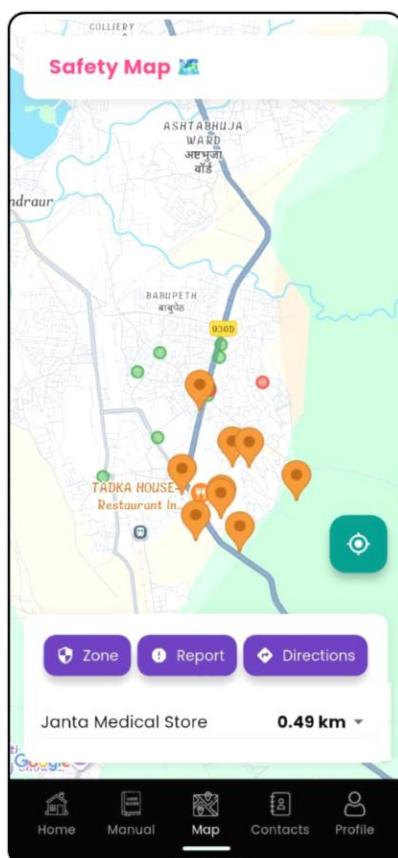


Fig.5.4.a: Location Page

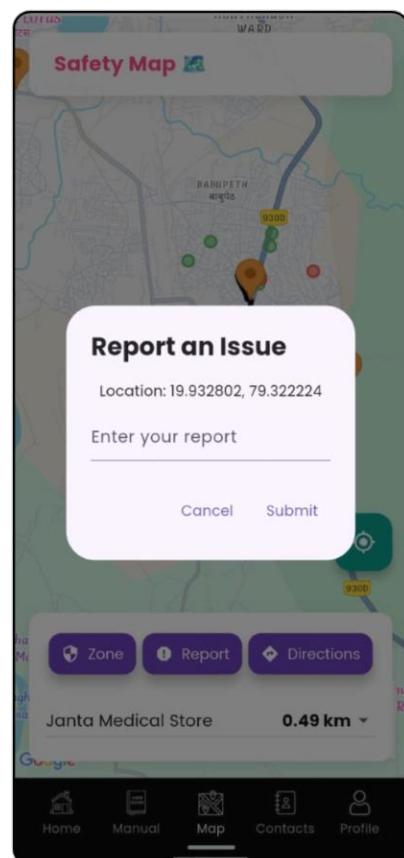


Fig.5.4.b:  
Report an issue

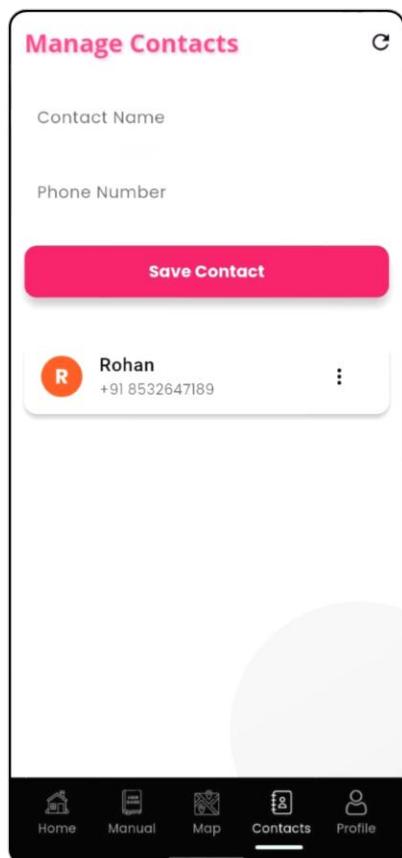
## 5.5 Contact Page

The Contact Management page in Shield Sister enables users to add, edit, and delete emergency contacts, which are essential for SOS alerts, live location sharing, and safety notifications.

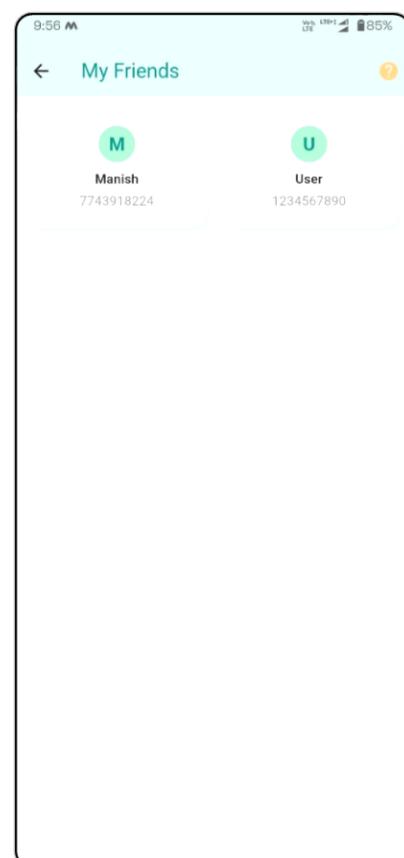
### Key Features:

- **Frontend:** Simple UI with input fields for **Contact Name** and **Phone Number**. Users can manage contacts easily.
- **Backend Process:**
  - Adding a contact triggers a **friend request** if the number belongs to a registered user.
  - The recipient gets an **in-app notification** to accept or reject the request.
  - Accepted requests link both users as friends; rejected requests are removed.
- **Database Usage:**
  - MongoDB: Stores user and contact data.
  - Firebase Firestore: Handles real-time friend request updates.
- **Deletion:** Removing a contact breaks the mutual friend connection.

This system ensures secure, real-time contact management while supporting key safety features.



**Fig.5.5.a:**  
**Contact Page**



**Fig.5.5.b:**  
**My Friends Page**

## 5.6 Manual And Helpline Page

The Manual and Helpline Pages in Shield Sister are key support features designed to enhance user safety, awareness, and accessibility during emergencies or for educational purposes.

### Manual Page:

Divided into four content-rich sections:

1. **Defence Manuals** – Self-defense guides and video tutorials.
2. **App Manuals** – User walkthroughs for navigating app features.
3. **Safety Manuals** – Blogs on personal safety, awareness, and precautions.
4. **Miscellaneous** – First-aid tips, community rules, and extra resources.

It combines **text, video, and interactive content** for both every day and emergency support.

### Helpline Page:

Offers quick access to verified emergency contacts:

- Categories include **women's safety, police, and crime-specific hotlines**.
- **One-tap dialling** lets users connect instantly, minimizing emergency response time.

These pages provide users with immediate guidance and communication tools, ensuring help is always within reach.

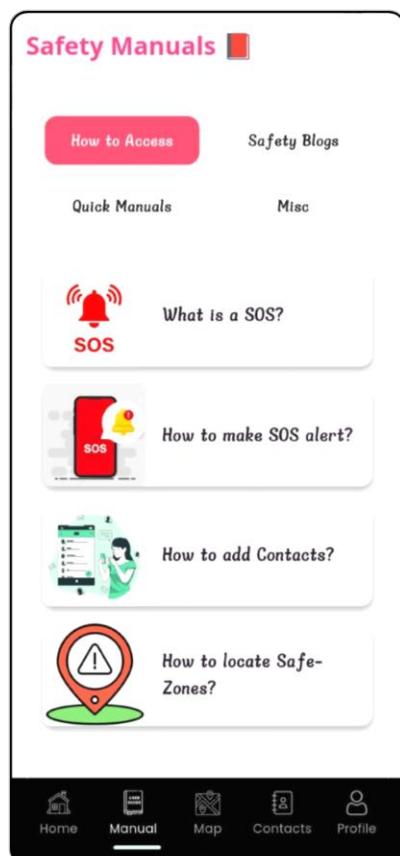


Fig.5.6.a: Manual Page

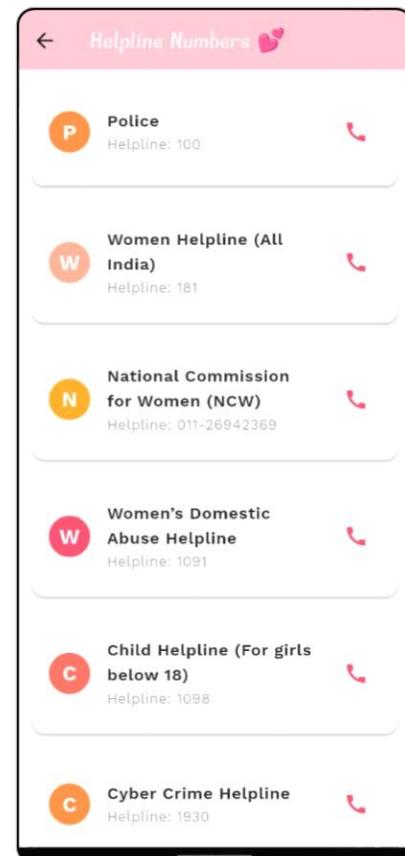


Fig.5.6.b: Helpline Page

## 5.7 Community Alert System

The Community Feature in the Shield Sister app fosters a safe and connected environment, enabling users—especially women—to share and view local safety-related updates in real time, functioning like a virtual neighbourhood watch. This feature empowers users with real-time local awareness, promotes and strengthens community safety.

### Key Features:

- **User Interaction:**

- Users can post text-only alerts (e.g., suspicious activity, tips, safety incidents).
- Each post includes time, location and type & appears anonymously or via user's name.

- **Frontend Interface:**

- Posts appear as map markers with details.
- A text box allows users to submit new posts quickly and easily.

- **Backend System:**

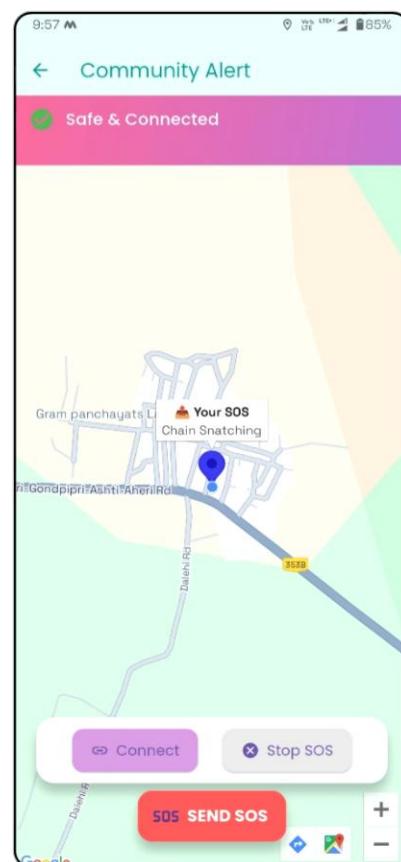
- Built with Node.js and MongoDB, storing user ID, time, zone, and coordinates.
- Posts are filtered by user's current area to maintain relevance and privacy.

- **Future Additions:**

- Post reporting and user blocking for enhanced safety.



**Fig.5.7.a:**  
**Community Alert Page**



**Fig.5.7.b:**  
**Community Alert Page (SOS)**

## 5.8 User Details Page

The User Profile Page in the Shield Sister app serves as a centralized hub for managing personal information, app settings, and support options, all within an intuitive and user-friendly interface. This page ensures users have full control over their identity and privacy while maintaining safety and usability.

### Main Components:

#### 1. Settings Page:

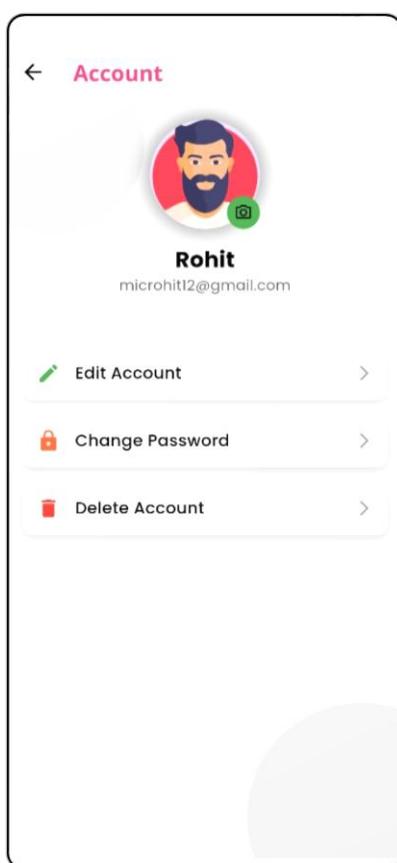
- Notification Settings: Control types and frequency of alerts.
- Battery Optimization: Prevents battery restrictions from affecting sirens and alerts.
- Location Settings: Manage location-sharing for SOS and map features.

#### 2. Profile Management:

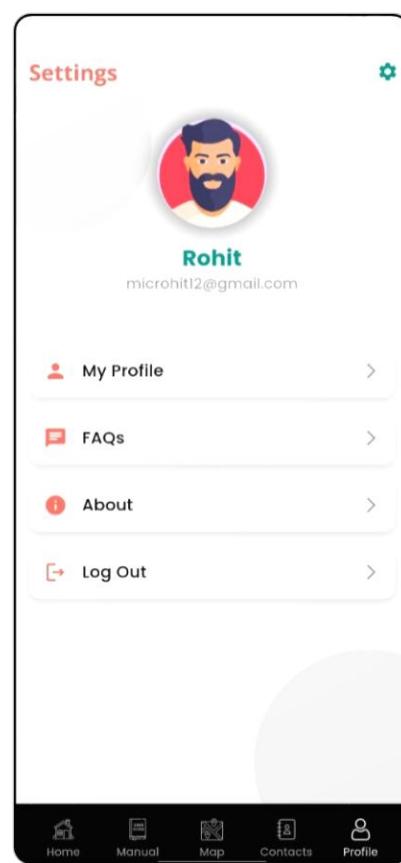
- Edit Profile: Update name, email, or phone number.
- Change Password: Secured with OTP verification.
- Change Profile Photo: Choose from animated male/female avatars.
- Delete Account: Permanently remove user data and profile.

#### 3. Support & Exit:

- Logout: Securely sign out of the app.
- FAQs: Get answers to common questions.
- About Section: Learn about Shield Sister's mission and team.



**Fig.5.8.a:**  
**User Details Page**



**Fig.5.8.b:**  
**Edit User Details**

**CHAPTER 06**

**RESULTS AND OBSERVATIONS**

## 6.1 RESULTS AND OBSERVATIONS

Shield Sisters has demonstrated significant effectiveness in enhancing user safety through a combination of fast response features, intuitive design, and data integration. Its standout SOS mechanism facilitates emergency communication by immediately notifying pre-selected contacts and local authorities, while simultaneously activating a loud siren to draw public attention. This instant response system has shown to reduce the time between the onset of a crisis and the initiation of aid, particularly in situations where every second matters.

One of the app's most impactful features is the ability to **report incidents in real time**, allowing users to contribute to a continuously evolving **Safe Area Score**. This community-driven safety index not only empowers users with localized safety insights but also fosters a sense of collective responsibility. Observations reveal that areas with higher user engagement tend to have more up-to-date safety scores, enhancing decision-making for all users in the vicinity.

Live location tracking is another key strength of Shield Sisters. Shield Sisters is optimized to maintain accurate tracking while minimizing power consumption—an essential factor for travellers and individuals on extended outings. This balance between performance and efficiency ensures the app remains active and dependable when needed most.

Overall, the integration of **instant alerts**, **real-time incident sharing**, and **location tracking** creates a multi-layered safety ecosystem. Users report increased confidence and peace of mind, knowing they are supported by both technology and community in potentially unsafe environments. Shield Sisters effectively bridges the gap between individual alerting tools and collaborative safety awareness, making it a standout solution in the personal safety app landscape.

**CHAPTER 07**

**CONCLUSION**

## **7.1 CONCLUSION**

Shield Sisters is a robust mobile application engineered to support women's safety through real-time tracking, emergency alerts, geofencing-based security protocols, and a community driven safety reporting framework. The application overcomes the shortcomings of existing safety tools by incorporating dependable SOS activation, real-time location sharing, and pre-emptive safety notifications. It harnesses technologies such as Flutter for cross-platform functionality, MongoDB for secure data management, Twilio for immediate emergency communication, and the Google Maps API for sophisticated geofencing, delivering a cohesive and efficient safety solution.

Experimental evaluations and testing validated the application's performance in practical settings. SOS alerts were transmitted within seconds, live tracking operated with negligible latency, and geofencing notifications effectively warned users prior to entering high-risk zones. The application was fine-tuned to optimize battery usage and enhance security, ensuring consistent performance even in areas with limited network connectivity.

Looking ahead, the incorporation of advancements such as AI driven threat detection, wearable device compatibility, offline emergency functionalities, and direct law enforcement integration will position Shield Sisters as a more advanced and accessible safety platform. This initiative underscores the transformative role of technology in mitigating security risks and equipping individuals with immediate protective measures. Through ongoing refinement and the expansion of its feature set, Shield Sisters offers a scalable and forward-thinking strategy for enhancing women's safety, contributing to the creation of safer public and private environments.

## **ACKNOWLEDGEMENT**

Our thanks to the project guide who have contributed to the development and refinement of the mobile application discussed in this paper.

## **CHAPTER 08**

## **FUTURE SCOPE**

## 8.1 FUTURE SCOPE

The Shield Sisters application holds significant potential for further enhancement through the adoption of emerging technologies. Future research and development efforts can target the following areas to strengthen its efficacy:

- **Artificial Intelligence-Based Threat Detection:** Subsequent iterations could leverage machine learning models to analyse user movement patterns alongside historical crime data. Such an approach would enable the system to anticipate potential risks, issue proactive safety notifications, and recommend safer routes in real time.
- **Wearable Device Integration:** Research could explore integrating the application with smartwatches and dedicated panic buttons, enabling users to activate SOS alerts instantaneously without needing to access their smartphones. This enhancement would accelerate response times and provide a more fluid mechanism for emergency assistance.
- **Offline Emergency Support:** To mitigate reliance on network connectivity, future versions could incorporate SMS-based distress signals and Bluetooth-enabled location sharing. These capabilities would allow users to transmit emergency alerts even in areas with limited network availability, ensuring functionality during critical situations.
- **Real-Time Law Enforcement Connectivity:** Additional development could prioritize direct integration with law enforcement agencies. Real-time distress signals could be relayed to police control centers, and automated crime reporting features could be introduced to facilitate incident documentation and enhance emergency response efficiency.

By integrating these advancements, Shield Sisters can transform into a more sophisticated, accessible, and effective safety solution. Ongoing contributions from researchers, developers, and policymakers will be instrumental in refining these enhancements, thereby fortifying the system's capacity to address women's safety challenges comprehensively.

**CHAPTER 09**

**REFERENCES**

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**CHAPTER 10**  
**APPENDICES**

## 10.1 Acceptance Certificate

### Journal Acceptance Certificate - IJSREM



## 10.2 Paper Publication



### A Location Based Safety Application for Enhancing Women's Safety

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**Abstract** - Women's safety remains a critical and urgent concern, as evidenced by the increasing incidence of harassment and violence, necessitating the development of innovative, technology-driven solutions. Although numerous mobile applications have been designed to address this issue, many fail to deliver essential functionalities. These deficiencies include the lack of real-time emergency response mechanisms, seamless tracking capabilities, and proactive safety features that meaningfully enhance user protection. Often, these applications rely on outdated alert systems and exhibit delayed SOS notifications, undermining their effectiveness in critical situations. To address these shortcomings, 'Shield Sisters' was developed as a Flutter-based mobile application aimed at equipping women with reliable and practical safety tools. The application integrates instant SOS alerts, real-time location tracking, an intelligent geofencing system, and a community-driven safety reporting mechanism. Its robust technological infrastructure comprises MongoDB, Node.js, and Firebase Firestore for efficient backend operations, the Twilio API for immediate emergency SMS notifications, and the Google Maps API for precise, real-time geolocation services. Shield Sisters classifies locations into Safe Zones (e.g., police stations and hospitals), Red Zones (e.g., high-risk areas), and Neutral Zones, providing users with timely warnings before entering potentially dangerous areas. Furthermore, its live tracking feature updates the user's location every ten seconds, enabling trusted contacts to monitor movements with accuracy. To ensure security and privacy, Shield Sisters employs SHA-256 encryption for password protection, JWT-based authentication for user verification, and role-based access controls to restrict emergency contact privileges. The application's performance, scalability, and security were rigorously evaluated using Flutter's testing framework, Thunder Client for API validation, and stress testing to assess server load capacity. Designed for speed, scalability, and dependability, Shield Sisters offers a trustworthy solution that users can rely upon in moments of need.

**Key Words:** women's safety application, real-time tracking, firebase, node.js, mongo DB, flutter Application

#### 1. INTRODUCTION

Violence, harassment, and assault against women remain pervasive and persistent challenges. In India, the National Crime Records Bureau documented over 400,000 reported crimes against women in 2021, underscoring an urgent need for enhanced safety measures [National Crime Records Bureau,

2022]. While various mobile applications have been developed to address this issue, many fall short in delivering critical functionalities. These shortcomings include the absence of real-time emergency responses, effective geofencing, and reliable tracking systems, often resulting in delayed SOS alerts, inconsistent background performance, and failure to function without stable connectivity, as noted in reviews of existing safety applications [Hodes et al., 2021]. Moreover, most existing solutions do not provide warnings prior to users entering high-risk areas. Shield Sisters was developed to address these deficiencies. The application integrates instant SOS alerts, real-time location tracking, an intelligent zoning system, and a community-driven mechanism for reporting safety concerns. Its robust technological framework includes MongoDB for secure data storage, Node.js for efficient backend processing, Firebase Firestore for live tracking, Twilio for emergency SMS notifications, and the Google Maps API for precise geolocation services. The SOS functionality serves as a critical feature, enabling users to trigger a distress signal by pressing a button. This action promptly sends an alert to designated contacts, accompanied by the user's exact location, battery status, and a timestamp. Additionally, the system activates a 'loud siren' to attract immediate attention, facilitating rapid assistance. The real-time tracking capability updates the user's position every ten seconds and allows trusted contacts to monitor movements remotely via a shared link. A distinguishing aspect of Shield Sisters is its geofencing system, which categorizes locations into safe zones (e.g., police stations and hospitals), red zones (e.g., areas with high crime rates or liquor stores), and neutral zones. The application issues alert to users approaching red zones, offering the opportunity to alter their route or seek assistance. Users can also contribute to a collective safety database by reporting hazardous areas, enhancing the system's effectiveness over time. The application simplifies emergency contact management, allowing users to add, modify, or remove contacts with real-time synchronization across all features. It further includes a safety manual and helpline section, providing self-defense guidance, legal rights information, and direct access to law enforcement and medical services through a single tap. Data security is prioritized, with SHA-256 encryption safeguarding passwords, JWT-based authentication verifying user identity, and role-based access controls restricting emergency contact privileges. Rigorous testing—utilizing Flutter's testing framework, Thunder-Client for API validation, and stress tests



for server capacity—has confirmed the application's scalability and resilience. This paper provides an in-depth examination of Shield Sisters, detailing its design, system architecture, development process, and testing methodologies. It also outlines prospective enhancements, including AI-driven threat prediction, offline emergency capabilities, and integration with law enforcement for expedited response times, aligning with emerging trends in safety technology research [Hodes et al., 2021]. By combining real-time tracking, proactive alerts, and community collaboration, Shield Sisters transcends conventional safety applications, offering a dependable and contemporary solution to improve women's security in daily life.

## 2. LITERATURE REVIEW

Numerous mobile applications have been developed to support women's safety, incorporating features such as emergency alerts, location tracking, and incident reporting. However, many of these applications exhibit significant limitations, including delayed SOS alerts, inconsistent tracking reliability, excessive battery consumption, and a dependency on continuous internet connectivity. For instance, Stree-Raksha provides SOS alerts and an audible siren but fails to operate effectively in the background, limiting its utility when the device is locked or in power-saving mode [Kolte et al., 2023]. Abhya integrates GPS tracking with law enforcement connectivity, yet its functionality is contingent upon uninterrupted internet access, rendering it less reliable in areas with poor network coverage [Singh et al., 2017]. Safetipin enables users to report unsafe locations and provides safety scores based on crowd-sourced data but lacks real-time tracking capabilities, reducing its effectiveness in dynamic emergencies [Ratnam & Sen, 2015]. Similarly, Safe Naari offers location tracking and audio/video recording functionalities, though it is hindered by inaccurate GPS performance and substantial battery usage, compromising its practicality over extended periods [Hodes et al., 2021]. A common drawback among these applications is the requirement of multiple steps to activate an SOS alert, resulting in delays during time-sensitive emergencies. Furthermore, most do not provide advance notifications to users approaching high-risk areas, limiting their proactive potential. Shield Sisters addresses these deficiencies by implementing an instantaneous SOS system that transmits alerts via SMS, ensuring operational reliability even in areas with limited network coverage, as evidenced by its design to overcome the connectivity issues seen in applications like Abhya [Singh et al., 2017]. The application updates the user's location every ten seconds, delivering precise real-time tracking, and employs a geofencing system that classifies regions into safe, red, and neutral zones, thereby offering proactive safety notifications—features that address the tracking and alert gaps noted in Safeti-pin and Safe Naari [Hodes et al., 2021; Ratnam & Sen, 2015]. Additionally, users can contribute to a community-driven safety network by reporting hazardous areas, enhancing collective security. Shield Sisters is designed to function efficiently in the background, maintaining its effectiveness even when the device is locked or operating in power-saving mode, thus resolving the operational challenges observed in Stree-Raksha [Kolte et al., 2023]. This approach aligns with broader research highlighting the need for reliable, low-connectivity solutions, positioning Shield Sisters as a comprehensive response to the

safety challenges underscored by the National Crime Records Bureau's report of over 400,000 crimes against women in India in 2021 [National Crime Records Bureau, 2022].

## 3. SYSTEM ARCHITECTURE

The system architecture of Shield Sisters is engineered to deliver real-time safety assistance, robust data management, and effective communication among users, emergency contacts, and backend services. It adheres to a client-server model, wherein the mobile application interfaces with a backend server, a database, and third-party APIs to provide core functionalities, including SOS alerts, real-time tracking, geofencing-based warnings, and secure authentication.

### System Components:

Shield Sisters comprises multiple integrated components, each tasked with distinct responsibilities to ensure a cohesive and reliable safety solution.

- ✓ **Mobile Application (Front-end):** Developed using Flutter, the application offers cross-platform compatibility for Android and iOS devices. The front-end manages user interactions, facilitates SOS alert activation, enables location tracking, and provides map-based geofencing notifications.
- ✓ **Backend Server:** Built with Node.js, the backend oversees user authentication, data processing, and API coordination. It ensures secure data transmission and efficiently handles user requests.
- ✓ **Database Management:** MongoDB serves as the database, storing user credentials, emergency contact details, SOS alert records, reported locations, and geofencing data. It supports rapid data retrieval while upholding stringent security and privacy standards.
- ✓ **Real-Time Tracking and Notifications:** Firebase Firestore enables real-time updates for location tracking, allowing designated contacts to monitor a user's movements. Firebase Cloud Messaging (FCM) delivers timely push notifications to keep users and contacts informed.

**Emergency Communication Services:** The Twilio API supports instantaneous SMS alerts for SOS notifications, ensuring that emergency messages are transmitted to trusted contacts, even in areas with limited network connectivity.

## 4. FEATURE & IMPLEMENTATION

### 4.1. Secure Login System

The application includes a secure login system where users register using an email and password. Authentication is managed through JSON Web Tokens (JWT), and passwords are stored securely in MongoDB with SHA-256 encryption. This ensures data protection and prevents unauthorized access.

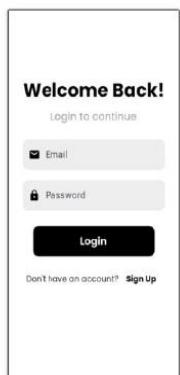


Fig-4.1a:  
Login Page

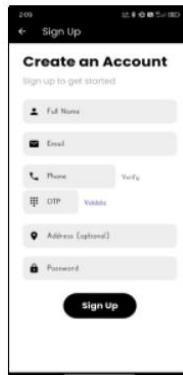


Fig-4.1b:  
Register Page



Fig-4.3:  
Map Page

#### 4.2. SOS Alert System

The SOS alert system allows users to trigger an emergency alert with a single tap. The system collects and sends the user's live location, battery percentage, and timestamp to registered emergency contacts via Twilio SMS services. Additionally, the application triggers a loud alarm to alert nearby people even if the phone is on silent mode.

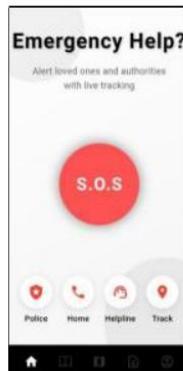


Fig-4.2:  
SOS Homepage

#### 4.4. Real-Time Location Tracking

Users can share their live location with trusted contacts through a generated tracking link. Location updates occur every ten seconds using Firebase Firestore. The tracking system is optimized for minimal battery consumption while maintaining accuracy.

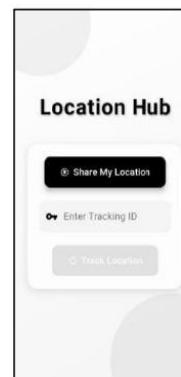


Fig-4.4a:  
Send Location

Fig-4.4b:  
Track Location

#### 4.3. Map and Zoning System

Shield Sister integrates a geofencing-based zoning system using Google Maps API. Locations are categorized into safe zones such as hospitals and police stations, red zones such as crime-prone areas and liquor stores, and neutral zones. The application alerts users before entering red zones and allows them to navigate toward safe zones. Users can also report unsafe locations, contributing to a community-driven safety network.

#### 4.5. Contact Management System

The application allows users to add, update, and remove emergency contacts. These contacts receive SOS alerts and tracking links when the user is in distress. Contact information is stored securely in MongoDB and updated in real time.

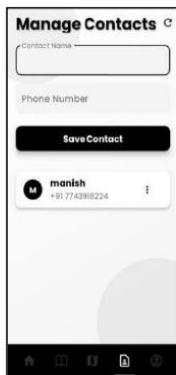


Fig-4.5:  
Contact Page



Fig-4.7a:  
Manual Page

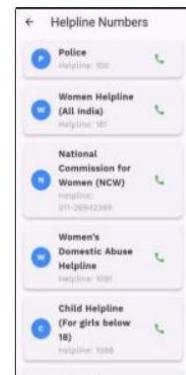


Fig-4.7b:  
Helpline Page

#### 4.6. User-Reported Safety System

Users can mark and report unsafe locations, which are then displayed to other users. Reports include details such as timestamps, location, and optional descriptions. This feature enhances community-driven safety awareness.

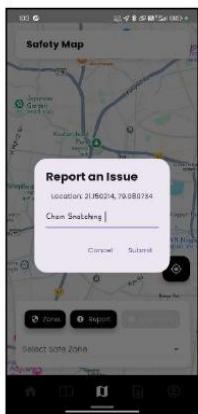


Fig-4.6:  
Reporting System

#### 4.7. Manuals and Helplines

Shield Sister provides in-app manuals containing self-defense tips, emergency response guides, and instructions on using the application's features. The helpline section includes emergency contact numbers, allowing users to call for help directly from the app.

#### 5. FUTURE SCOPE

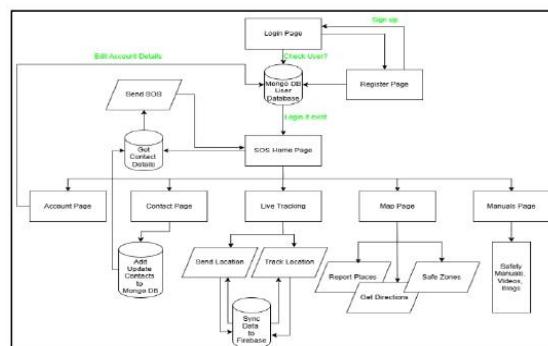
The Shield Sisters application holds significant potential for further enhancement through the adoption of emerging technologies. Future research and development efforts can target the following areas to strengthen its efficacy:

- **Artificial Intelligence-Based Threat Detection:** Subsequent iterations could leverage machine learning models to analyze user movement patterns alongside historical crime data. Such an approach would enable the system to anticipate potential risks, issue proactive safety notifications, and recommend safer routes in real time.
- **Wearable Device Integration:** Research could explore integrating the application with smartwatches and dedicated panic buttons, enabling users to activate SOS alerts instantaneously without needing to access their smartphones. This enhancement would accelerate response times and provide a more fluid mechanism for emergency assistance.
- **Offline Emergency Support:** To mitigate reliance on network connectivity, future versions could incorporate SMS-based distress signals and Bluetooth-enabled location sharing. These capabilities would allow users to transmit emergency alerts even in areas with limited network availability, ensuring functionality during critical situations.
- **Real-Time Law Enforcement Connectivity:** Additional development could prioritize direct integration with law enforcement agencies. Real-time distress signals could be relayed to police control centers, and automated crime reporting features could be introduced to facilitate incident documentation and enhance emergency response efficiency.

By integrating these advancements, Shield Sisters can transform into a more sophisticated, accessible, and effective safety solution. Ongoing contributions from researchers, developers, and policymakers will be instrumental in refining these enhancements, thereby fortifying the system's capacity to address women's safety challenges comprehensively.

## 6. DIAGRAMS AND FLOWCHARTS

### Application Flowchart:



**Fig-6.1: Flowchart of Application**

## 4. RESULT & ANALYSIS

Shield Sister stands out from existing safety apps with its fast emergency response and user-friendly interface. The SOS feature instantly notifies emergency contacts and nearby authorities, triggering a loud siren for immediate attention. Users can also report incidents in real-time, contributing to a dynamic Safe Area Score that helps assess location safety. The app's live tracking ensures accurate location sharing with minimal battery consumption, making it reliable for travel.

By combining instant alerts, community-driven safety insights, and real-time tracking, Shield Sister empowers

## 3. CONCLUSIONS

Shield Sisters is a robust mobile application engineered to support women's safety through real-time tracking, emergency alerts, geofencing-based security protocols, and a community-driven safety reporting framework. The application overcomes the shortcomings of existing safety tools by incorporating dependable SOS activation, real-time location sharing, and preemptive safety notifications. It harnesses technologies such as Flutter for cross-platform functionality, MongoDB for secure data management, Twilio for immediate emergency communication, and the Google Maps API for sophisticated geofencing, delivering a cohesive and efficient safety solution.

Experimental evaluations and testing validated the application's performance in practical settings. SOS alerts were transmitted within seconds, live tracking operated with negligible latency, and geofencing notifications effectively warned users prior to entering high-risk zones. The application was fine-tuned to optimize battery usage and enhance security, ensuring consistent performance even in areas with limited network connectivity.

Looking ahead, the incorporation of advancements such as AI-driven threat detection, wearable device compatibility, offline emergency functionalities, and direct law enforcement integration will position Shield Sisters as a more advanced and

accessible safety platform. This initiative underscores the transformative role of technology in mitigating security risks and equipping individuals with immediate protective measures. Through ongoing refinement and the expansion of its feature set, Shield Sisters offers a scalable and forward-thinking strategy for enhancing women's safety, contributing to the creation of safer public and private environments.

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### 10.3 Annexure



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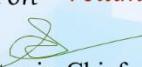
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