

SafeConnect: An Inclusive Personal Safety, Connectivity and Real-Time Emergency Alert App

by

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A project submitted to the Department of Computer Science and Engineering
in partial fulfillment of the requirements for the degree of
B.Sc. in Computer Science and Engineering

Department of Computer Science and Engineering
Brac University
February 2025

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Declaration

It is hereby declared that

1. The project submitted is my own original work while completing degree at Brac University.
2. The project does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The project does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

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Approval

The project titled “SafeConnect: An Inclusive Personal Safety, Connectivity and Real-Time Emergency Alert App” submitted by Rayean Mahmud Arnob (20101612) Of Fall, 2024 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science and Engineering on February 7, 2025.

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Abstract

Developing effective personal safety tools has become crucial in response to rising safety concerns in today's world. This project focuses on the development and evaluation of SafeConnect, a mobile application designed to enhance personal safety, improve connectivity, and provide rapid emergency response in real-time. SafeConnect's goal is to equip individuals with tools for proactive risk management, which helps to access fast support in urgent situations. This app is developed using Flutter framework which provides seamless cross-platform experience. The core functionality of this app includes key features such as emergency contact integration, real-time chat with guardians, and location-based services through interactive maps. Users can trigger a high-priority emergency alert message with their real-time location details, by pressing a panic button or shaking their phone. Additional features include anonymous incident reporting, access to inspirational content and safety guidelines. In addition, SafeConnect uses Firebase to connect in real-time to the database, as well as the Google Maps API for obtaining accurate geolocation. SafeConnect connects emergency requirements and technological solutions together to fasten the process for people to respond to an emergency.

Keywords: Personal Safety, Emergency Response, Real-Time Alerts, Mobile Application, Cross-Platform Development, Panic Button, Location Tracking, Shake Features, Flutter, Firebase, Google Maps API.

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Chapter 1

Introduction

1.1 Background and Motivation

In a fast-paced and interconnected world, personal safety is an increasing concern for people of all ages and backgrounds. With urbanization accelerating, the crime rates rising, and natural or man-made calamities occurring around the globe, there has been a growing need for new technology to tackle our safety challenges. Smartphones have become widely available and mobile apps have evolved to be a functional tool to improve safety and connectivity in life-threatening circumstances.

SafeConnect emerged from the expanding demand for an inclusive network platform dedicated to handling emergencies and strengthening safety awareness along with community accountability. Emergency response strategies currently fail to deliver efficient service alongside real-time monitoring and universal access which makes individuals exposed during critical emergency situations. SafeConnect aims to re-define personal safety and emergency management by integrating advanced features such as real-time location tracking, emergency alerts, and community engagement tools.

1.2 Problem Statement

Technological growth has not eliminated the problem of emergency communication difficulties experienced by people during urgent situations. Key challenges include the lack of a centralized platform for connecting with emergency services and trusted contacts, delays in communication during high-pressure situations, the inability to anonymously report unsafe incidents or locations, limited accessibility to real-time location sharing and interactive map services that could help locate nearby assistance, insufficient integration of advanced features such as panic buttons or automated emergency notifications, which can save valuable time and limited resources for proactive safety measures.

Available applications either provide restricted emergency contacts or locations yet fail to unite these features into an integrated solution. Current safety systems lack integration between their components which results in time delays or operational inefficiencies when effective response is crucial. Applications must bridge critical gaps between modern safety systems because they need to enable seamless connectivity

combined with reliable emergency tools accompanied by comprehensive resources to ensure safety and well-being.

1.3 Objectives of the Project

The main priority of SafeConnect is to create an application that promotes personal safety through its strong platform and intuitive design. The specific goals include:

- **Enhancing Personal Safety:** Through Google Maps API the application delivers immediate location-oriented emergency alerts and services to users.
- **Facilitating Real-Time Communication:** In-app users can connect to their trusted contacts and guardians by using a built-in chat system and emergency calling abilities.
- **Promoting Community Responsibility:** People can anonymously report incidents and unsafe areas to improve local community safety through this system.
- **Empowering Users:** Users get essential safety information together with motivational content and motivational quotes to boost their preparedness during dangerous situations.
- **Ensuring Accessibility:** Create an application that works across different device platforms targeting Android and iOS systems.

The objectives seek to develop an emergency-management tool that users can reliably maintain during critical situations to access communication with their support network.

1.4 Scope of the Project

SafeConnect accomplishes functionality for various categories of users starting from individuals and stretching to families and communities. Users can benefit from essential features that include real-time location tracking together with emergency alert messages. Through its interactive map users can easily locate nearby essential resources that include police stations together with hospitals and pharmacies which provide critical assistance in emergency situations. Users can access two distinct safety tools through the app's shake-to-alert operation along with an anonymous reporting capability. The present mobile app level of development will receive future updates to add web functionality.

1.5 Organization of the Report

The project includes multiple chapters which provide an organized overview of the entire project's scope.

- **Chapter 1: Introduction** – Provides the background, problem statement, objectives, scope, and an overview of the report's structure.
- **Chapter 2: Related Work** – The related work section reviews previously conducted personal safety research and technology studies by examining the deficits that SafeConnect actively addresses.
- **Chapter 3: System Analysis** – This section includes functional and non-functional requirements, use cases, and feasibility studies.
- **Chapter 4: System Design and Methodology** – The application development uses this section to present its tools and technologies together with design approaches.
- **Chapter 5: Implementation** – This section includes the details of development environments and implementation of frontend integration and backend integration.
- **Chapter 6: Results and Discussion** – This section shows how the application functions from a reliability and effectiveness viewpoint.
- **Chapter 7: User Manual** – This section includes the installation guide, setup, and user guide to use all the features properly.
- **Chapter 8: Conclusion and Future Work** – The final section of this work provides conclusions from the research alongside an analysis of project value and specifics for improvement in the SafeConnect framework.

The systematic approach delivers straightforward comprehension of project development steps while revealing both its critical value and potential improvements.

Chapter 2

Related Work

2.1 Overview of Personal Safety Applications

The increasing number of safety issues in contemporary society drove developers to create different applications for personal safety. Mobile applications implement GPS tracking and emergency alert capabilities to establish tools that people can use for self-defense combined with risk minimization and quick emergency support [9].

The research presents a system for monitoring the geolocation of registered platform users. The application provides emergency calling capability to reach registered contacts while automatically sending location details to contacts using SMS until stopped by the user. When activated, the application uses GPS tracking to deliver the user's position data to their designated contact by SMS delivery. The SMS transmission will continue to the registered contact with five-minute intervals until the user explicitly halts the application [8].

HearMe application provides multiple features that include receiver device notification through siren sound along with lock screen accessibility. Users can activate any of its modules through hardware buttons so they can secure assistance rapidly. The loud siren function on HearMe [2] allows the receiver to obtain help, which still operates even when their device is set to silent mode.

Through this mobile software, users can deliver their GPS position to pre-selected emergency contacts when tapping on the display button. Each 300-meter trade-in location triggers an automatic reset of coordinates to help establish updated positions [1].

Self-defense operates through technologies integrated within a small portable device. The device functions as either a wristband or wristwatch, which sends alert information including attack data and body posture while the device's location and SMS are automatically sent via two pre-defined emergency contact numbers [3].

2.2 Existing Solutions and Their Drawbacks

The marketplace features numerous personal safety apps; however, most applications show major drawbacks. Traditional safety applications focus mainly on alerts yet fail to address preventive security features and public involvement [4]. Operating system incompatibility problems combined with insufficient data security

protocols make some applications less reliable and effective [5]. The majority of current emergency aid solutions present a critical weakness because they do not include maintenance features that extend past emergency responses to support emotional care and ongoing assistance.

2.3 The Role of Technology in Personal Safety

Technology plays a multifaceted role in enhancing personal safety:

- **Real-time Monitoring and Tracking:** Through GPS technology, users can track their position in real-time, which lets them notify trusted contacts for faster emergency assistance [6].
- **Enhanced Communication:** Through mobile applications, users gain direct contact capabilities that let them reach emergency responders and reach out to loved ones during emergencies [9].
- **Proactive Safety Measures:** Through safety-related content alongside risk assessment tools and community information sharing, users obtain data needed to protect themselves and take precautionary measures [7].
- **Increased Accessibility:** Mobile applications provide easy-to-access personal safety tools through their convenient features, which are available across different demographics and locations [4].

2.4 Research Gaps and Justification for SafeConnect

The field continues to show numerous research gaps even though multiple solutions currently exist. Many digital safety applications take narrow security approaches by omitting essential components for personal well-being and support from both community networks and enduring needs [5]. The present solutions fail to deliver sufficient responses for the diverse user requirements and different technological fluency levels across various user groups [4].

SafeConnect aims to address these gaps by:

- **Integrating Proactive and Reactive Safety Measures:** The comprehensive approach to personal safety enabled by SafeConnect results from the integration of emergency notifications with safety guidance along with motivational content and incident reporting functionality.
- **Prioritizing User Well-being:** The app includes a chat function with guardians along with motivational quote features that combine emotional assistance with lasting well-being support.
- **Fostering Community Engagement:** A combination of self-reporting systems and user input methods generates coordinated safety initiatives that help communities build safer environments.

- **Ensuring Inclusivity:** The Flutter framework's cross-platform capabilities, together with its friendly interface, enable SafeConnect to serve users from diverse backgrounds.

The research gaps that SafeConnect addresses aim to develop an enhanced solution that effectively safeguards personal safety and well-being within digital spaces.

Chapter 3

System Analysis

3.1 Requirement Analysis

3.1.1 Functional Requirements

User Registration and Login

- Users must be able to register and log in with valid email addresses and passwords.
- This app should allow users to securely access its features and data by providing a comprehensive user authentication system that includes user registration and login functionalities, integrated using Google Firebase.

Emergency Contacts

- Users can access a list of essential emergency contact numbers, including emergency services, ambulance, fire brigade, and anti-terrorism unit authority.
- The app must allow users to search contacts from their phone contact list and add trusted contacts, such as family members, friends, or guardians.
- Users must be able to customize their contact list by adding or removing contacts, allowing them to choose who gets notified in an emergency.

Emergency Call

- Users can initiate an emergency call by simply tapping a single button.
- Users must be able to instantly connect with emergency authorities, services, or any trusted contact.

Real-time Location Tracking

- The app should access and display the user's real-time location accurately.
- Location data is utilized for emergency assistance and visual representation on the map page.

Location-based Services and Map Page

- Users can view a map page displaying markers for relevant locations (nearby police stations, hospitals, pharmacies, and bus stations) by simply tapping a button.

Motivational Quotes

- The app must present a collection of motivational quotes that users can access for inspiration.

Safety Guides and Motivational Articles

- The app must feature sections offering safety tips and guidelines for various situations.
- Users must have access to motivational articles aimed at empowering and uplifting them.

Chat with Guardians

- Users can initiate communication with designated guardians.
- Guardians can also initiate communication to check on the user's safety and well-being.
- The chat functionality must facilitate message exchange, location sharing, and photo sending in real-time.
- Users must be able to remove any messages if they want.

Emergency Alert Button

- The alert button must be easy to activate with a single tap.
- The alert button must send emergency alert messages to trusted contacts instantly.
- Emergency messages must include the user's real-time location information.

Shake Feature

- Users can send an emergency message by shaking their phone instantly.
- The app must automatically send the user's location to designated trusted contacts.

Profile Update

- Users must be able to update their profile name and profile picture.
- Users must be able to select a profile picture from their device's gallery.
- Users must be able to enter their new profile name.
- The changes must be saved to the user's profile.

Anonymous Reporting and User Reviews

- Users must be able to submit anonymous reports or reviews about incidents or unsafe locations.
- Users must be able to search and see reviews of any location on the review page.

3.1.2 Non-Functional Requirements

Usability

- The app must present a user-friendly design that offers basic functions to all users regardless of skill level or age.

Performance

- The app must display emergency functions alongside real-time location data within one to two seconds for fast response availability.

Security

- The app must provide secure authentication services with encryption to protect database communications and user data privacy.

Reliability

- The app's emergency alert system, alongside location tracking and shake activation, must work correctly in any situation.

3.2 Target Users and Use Cases

3.2.1 Target Users

The primary users of SafeConnect include:

1. **Individuals Seeking Personal Safety:** General users who seek an efficient emergency response system constitute the primary target market for SafeConnect.
2. **Caregivers and Guardians:** Family guardians and child care providers use the system to monitor dependents including elderly relatives and children.

3. **Community Members:** Community members can help maintain safety by reporting dangerous situations without revealing their identity.

3.2.2 Use Cases

1. **User Registration and Login:** Users need to create an account or log into the system to access in-app messaging functionalities.
2. **Emergency Assistance:** Users need just one action to initiate an emergency alert through pressing the panic button or shaking their device, but both actions automatically send emergency messages and display their current location to trusted contacts.
3. **Accessing Emergency Contacts:** Through the app's interface, users can directly access and modify their emergency contact list to ensure immediate communication channels.
4. **Guardian Communication:** For safety purposes, guardians use chat features to monitor users' well-being while also exchanging messages and requesting current locations.
5. **Anonymous Reporting:** Users submit incident reports without providing personal information so other users can see reported dangerous areas.

3.3 Feasibility Study

3.3.1 Technical Feasibility

The app implements current programming standards which include Flutter alongside Google Maps API and Firebase for multi-platform support and real-time data transmission along with geolocation functionality. By integrating these tools, the application demonstrates technical feasibility.

3.3.2 Economic Feasibility

Open-source technologies including Flutter and Firebase work together to keep development expenses low but preserve the app's capacity to scale.

3.3.3 Operational Feasibility

The growing market demand for personal protection solutions makes SafeConnect address a crucial social necessity, which will help it gain widespread acceptance from its target audience.

3.4 Key Challenges Addressed

1. **Emergency Response Time:** The application shortens emergency notification delays between users and their trusted contacts through real-time locating and shake functionality.
2. **Holistic Safety Solution:** Unlike existing solutions, SafeConnect presents a unique approach by integrating multiple safety functions within a single application, including emergency alerts and guardian communication along with anonymous reporting and motivational support features.
3. **Accessibility and Inclusivity:** Through its user-friendly interface combined with multiple operating system support, the app allows different demographic groups to access the system.
4. **Community Empowerment:** Users maintain safety through both anonymous reporting of incidents and location reviews that promote collective safety.
5. **Data Privacy and Security:** The integration of secure authentication features with encrypted communication protects user data from unauthorized access.

Chapter 4

System Design and Methodology

4.1 Technology Stack

SafeConnect employs a robust technology stack to ensure a seamless and effective user experience, combining the power of modern frameworks and languages:

4.1.1 Framework: Flutter

The SafeConnect project uses Flutter, which functions as Google’s innovative open-source framework. This adaptable framework brings multiple advantages that perfectly support the application’s primary goals. The cross-platform nature of Flutter makes SafeConnect functional on Android devices while saving development resources and maintaining application uniformity. As a developer, I have concentrated on Android, but Flutter’s architecture enables expanding SafeConnect’s reach to iOS and the web through the same source code base. SafeConnect benefits from its excellent performance features, which enable smooth transitions and immediate user responses, thus optimizing its overall functionality. The hot reload tool of Flutter helps to speed up the development process so they can better refine and update their application features. The framework gives developers access to its extensive widget library to design customized expressive interfaces, and its wide plugin ecosystem extends SafeConnect’s capabilities. Through its implementation of Flutter’s benefits, SafeConnect constructs an immersive customer experience that effectively delivers its mission of personal safety while upholding their well-being.

4.1.2 Language: Dart

Programming for Flutter app development mainly uses Dart, which operates throughout frontend and backend operations. As an object-oriented programming language, Dart uses classes and offers a neat syntax that users can easily understand. Dart offers front-end development optimization with features including asynchronous programming to create reactive interfacing when developing responsive user interfaces. Dart implements both Just-In-Time (JIT) and Ahead-Of-Time (AOT) compilation, which enhances application performance.

4.1.3 Backend Services and Database

Firestore Services

Google’s all-encompassing platform, Firebase, enables seamless integration into the SafeConnect application, which boosts both functionality and security while enabling real-time capabilities. Firebase forms the backbone of systems that deliver reliable user experience performance.

- **Authentication:** The application uses Firebase Authentication to manage user accounts for application registration and account authentication, as well as secure feature access.
- **Scalability:** Firebase implements a scalable architecture, which enables the app to maintain user-active performance alongside scaling data storage capacity while providing optimal speed and efficiency.
- **Cloud Functions:** Through serverless operations offered by Firebase Cloud Functions, users can automatically execute essential business processes, including sending emergency alerts.
- **Realtime Database:** User-driven data synchronization provided by Firebase’s Realtime Database serves as important functionality for chat messaging and updating platform users in real time.
- **Secure Communication:** The secure infrastructure implemented by Firebase uses protected communication, which encrypts backend communication to protect user data while maintaining privacy for their activities.

Cloud Firestore

The core component of Firebase known as Firestore delivers essential capabilities to the SafeConnect application. The real-time data storage capabilities of Firestore provide users direct access to essential user profile data. Its data storage model, along with reliability features, allows real-time location notifications and chat functions to deliver responsive performance. The app demonstrates its dedication to user-first security by integrating Firestore, which establishes a robust real-time platform focused on user’s protection and empowerment.

SQLite

In Flutter applications, SQLite functions as a database package used by developers to implement local database capabilities for managing application-specific data. The fundamental role of SQLite structures the contact storage function within the SafeConnect application interface. The capability to manage emergency contacts offline gives users enhanced privacy protection and improved response times, while providing an improved user experience. SafeConnect implements SQLite as part of its mission to blend technology with compassionate methods for delivering an effective personal safety solution through its platform.

Google Maps API Integration

The integration of the Google Maps API in SafeConnect delivers precise location services with its map page functionality. Through this integration, users can see emergency markers, find nearby services, and track their real-time location.

4.2 System Architecture Design

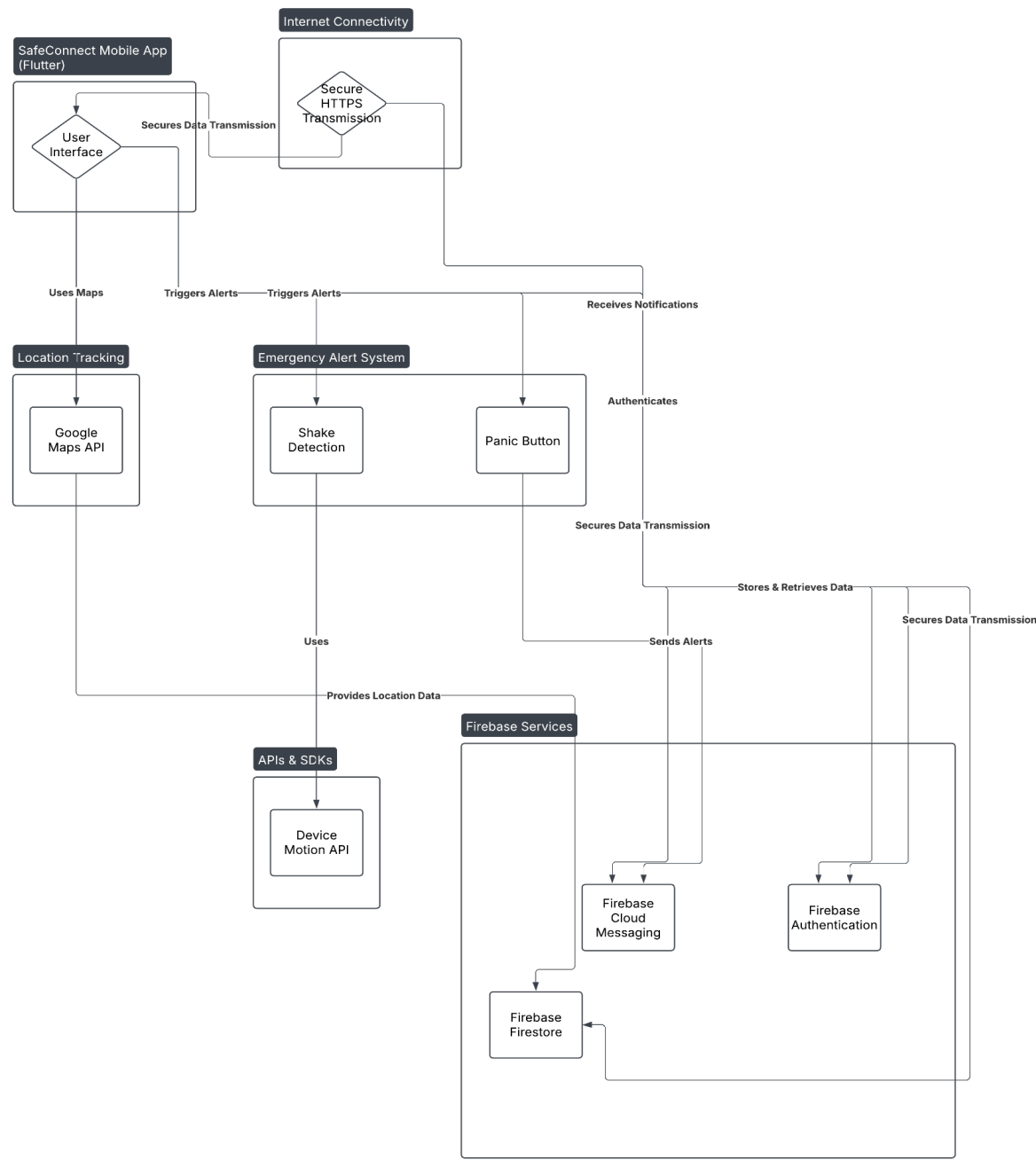


Figure 4.1: System Architecture Diagram

4.3 Use Case Design

The primary interactions within the SafeConnect application appear in the Use Case Diagram.

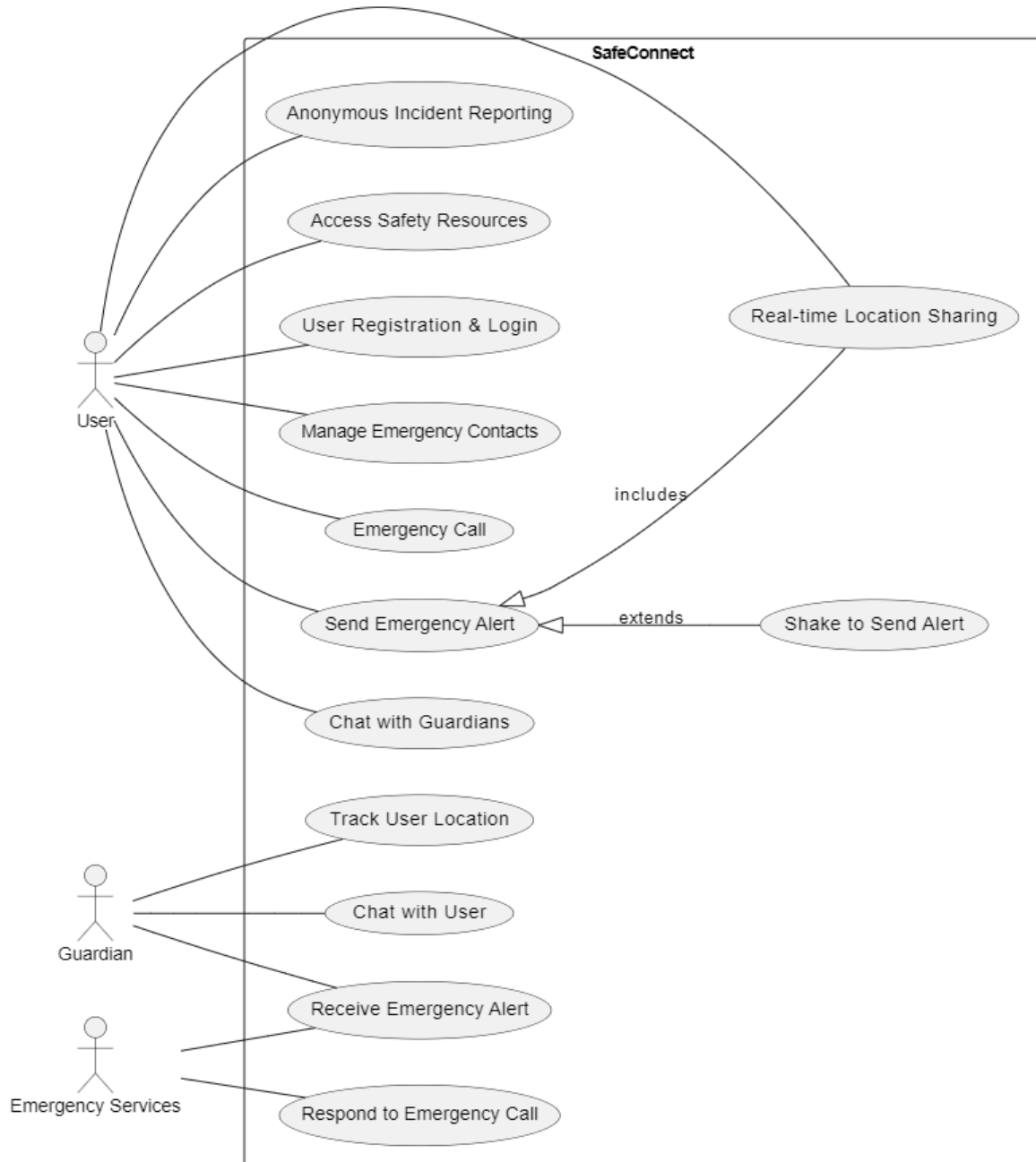


Figure 4.2: Use Case Diagram

Three primary actors named Users (Individuals), Guardians, and Emergency Services form a part of this system. Through the application, users create accounts and handle their emergency contacts and panic alerts and shake commands and maintain in-app chat with guardians. The application enables guardians to monitor user locations and support real-time conversation through the system.

4.4 Data Flow Diagram (DFD)

The Data Flow Diagram (DFD) for SafeConnect demonstrates system user engagements with features including registration processes as well as contact management and emergency alert and safety resource utilization.

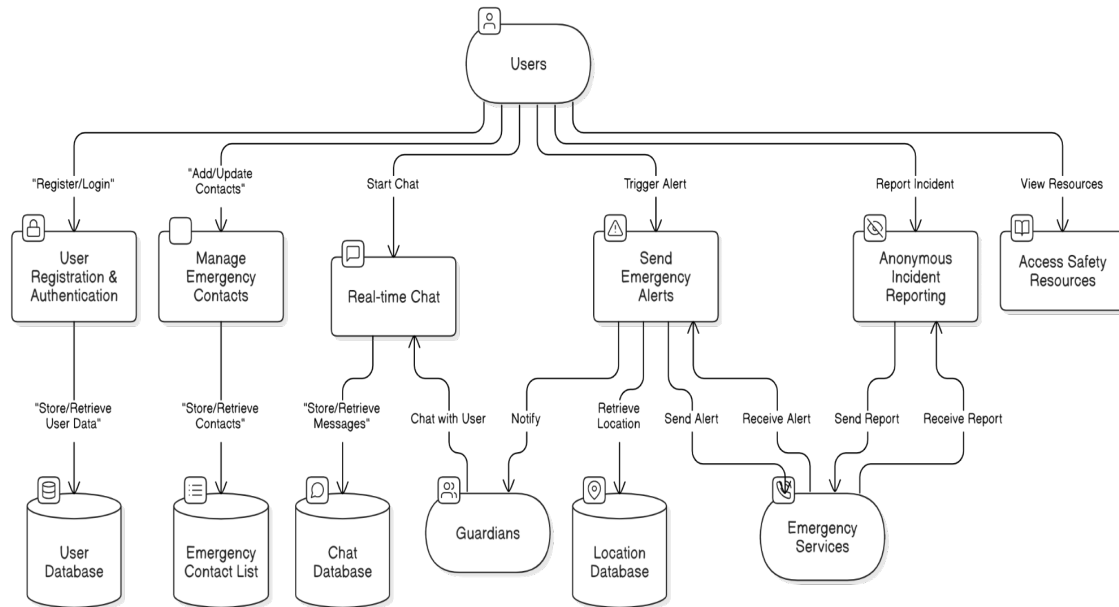


Figure 4.3: Data Flow Diagram

The system processes alerts by sharing real-time location data to guardians and emergency responders while enabling real-time chat during such situations. SafeConnect relies on Firebase Authentication as a user data store in addition to SQLite for emergency contacts and Firestore for its chat data to achieve smooth data management. The diagram presents a comprehensive view which shows how SafeConnect handles data processing steps for better emergency safety and response functionality.

4.5 Class Diagram

This diagram represents the core entities and their relationships in the SafeConnect system.

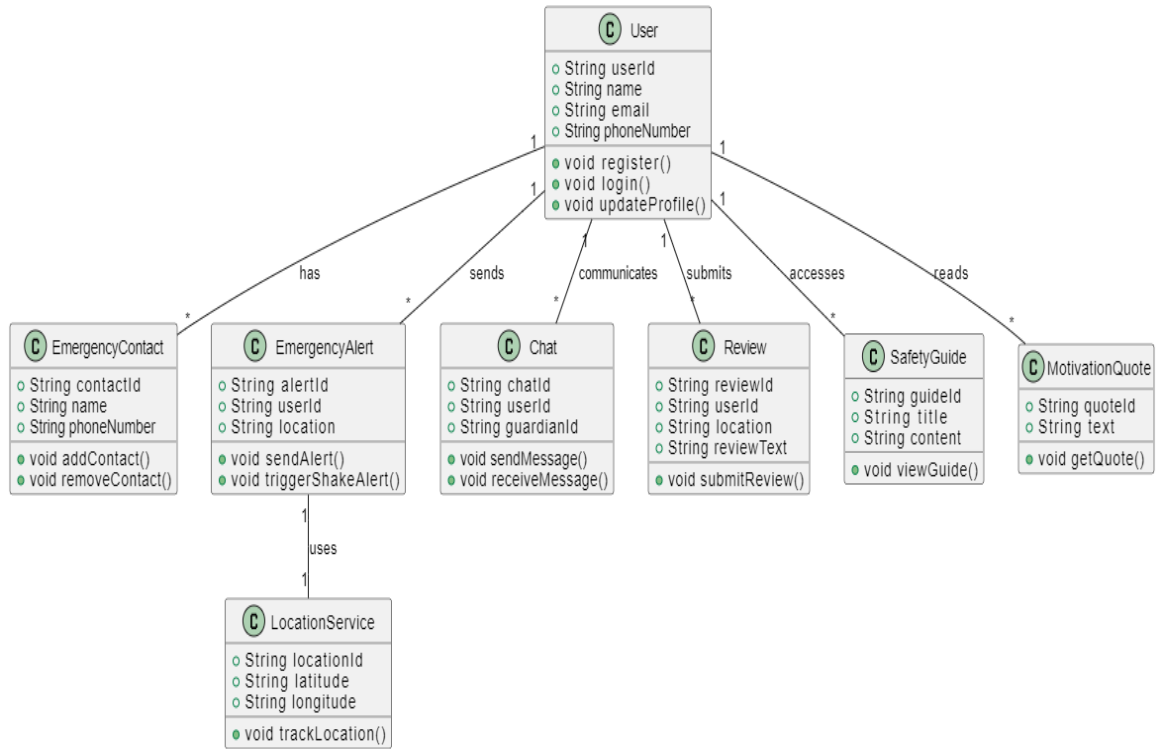


Figure 4.4: Class Diagram

This class diagram provides an overview of the SafeConnect system structure, showing how different components interact. It is designed to clearly represent the relationships between the user, emergency contacts, alerts, and support services.

4.6 Sequence Diagram

This diagram illustrates the interactions between the user, the SafeConnect app, the location service, and emergency contacts.

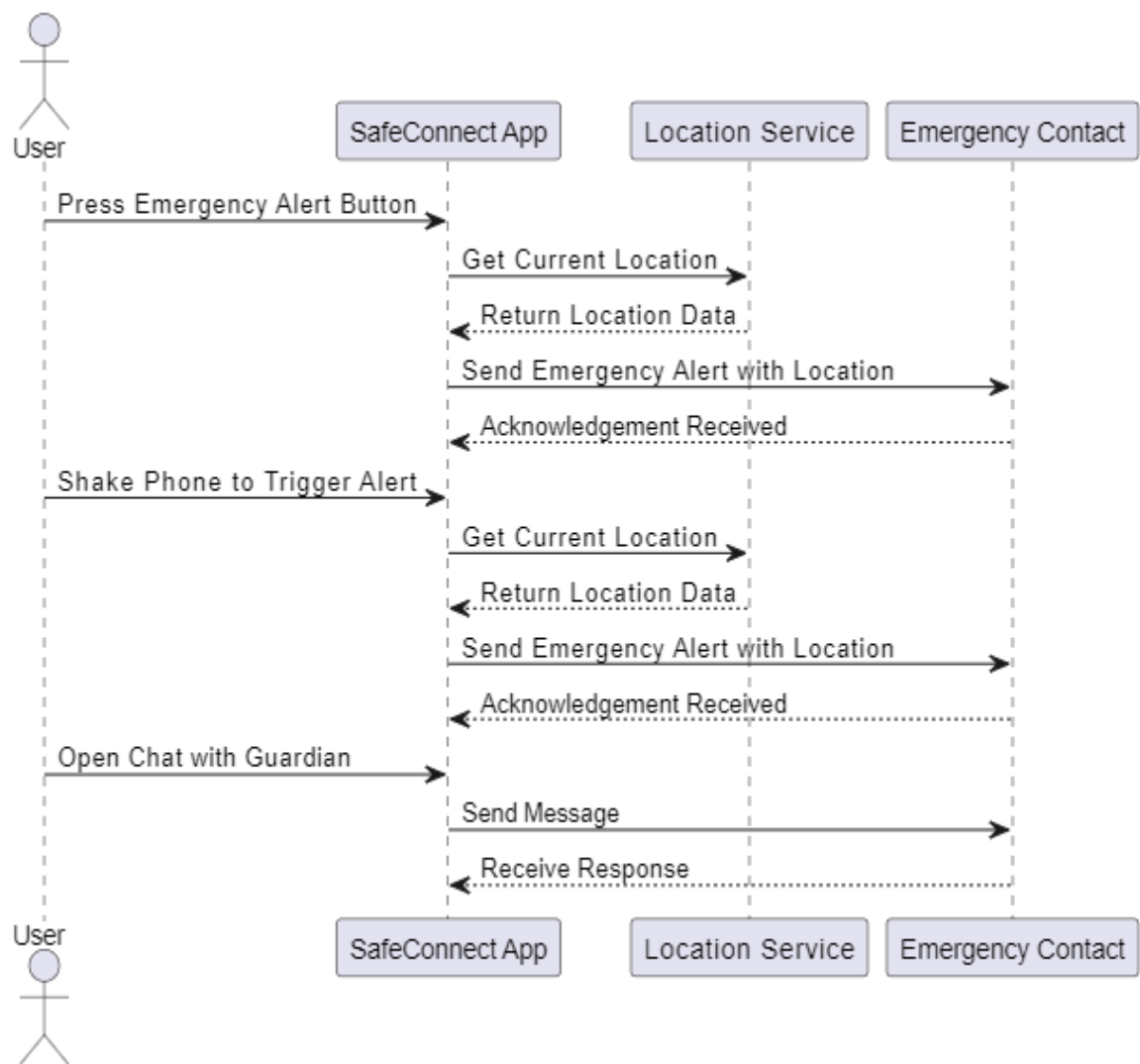


Figure 4.5: Sequence Diagram

This sequence diagram helps visualize the workflow of emergency alert handling and communication in SafeConnect.

Chapter 5

Implementation

5.1 Development Environment

The development environment stands vital for achieving efficient workflow as well as successful execution of the SafeConnect project. The following tools and platforms were used:

- **IDE: Visual Studio Code** – It provides an outstanding development environment because it combines powerful extensions with multiple language support and a lightweight system suitable for Flutter development.
- **Operating Systems: Windows 10** – The development and testing were conducted on Windows 10 to ensure cross-platform compatibility.
- **Programming Language: Dart** – The development of mobile applications with Flutter employs Dart as its programming language.
- **Database: Firebase, Firestore** – Chosen for its real-time capabilities and seamless integration with Flutter.
- **Version Control: Git and GitHub** – Used for source code management.
- **APIs & SDKs:** Google Maps API, Firebase Authentication, and Firebase Cloud Messaging – For core functionalities.

5.2 Frontend Development

The “SafeConnect” application’s frontend development relies on Flutter framework implementation. The Flutter framework delivers a dynamic user interface experience that remains consistent across all platforms. Create responsive visually attractive interfaces for enhanced user experience using a unified codebase. The vast selection of widgets supplied by Flutter lets developers design custom components which create superior user-friendly layouts.

5.2.1 User Interface Design with Flutter Widgets

The Flutter platform gives applications access to various adaptable widgets for building their user interface components. The widgets `Card`, `Container`, and `InkWell` help developers design responsive components which provide both visual appeal and interactive features .

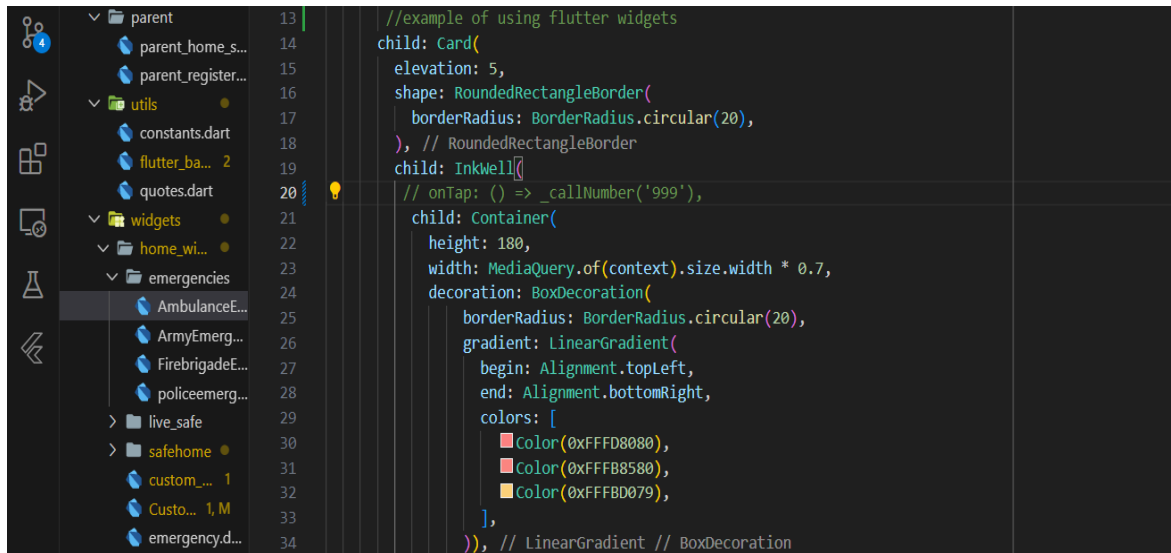


Figure 5.1: Code Snippet of Flutter UI Widgets

5.2.2 Navigation and Routing:

Users navigate within the app through built-in features of Flutter's navigation system. The combined use of the `Navigator` widget with named routes allows users to move smoothly between screens and sections of the application.

5.2.3 Integration of External Packages and implementing widgets:

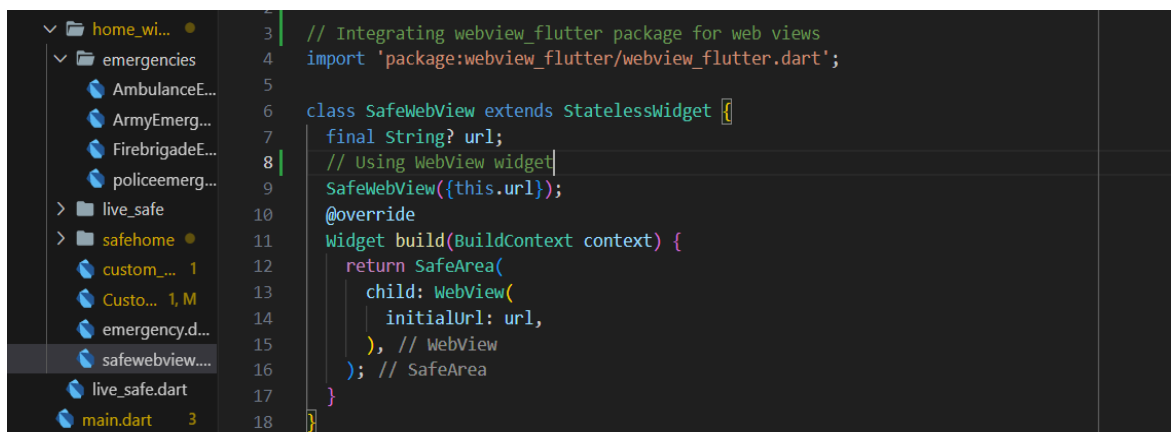


Figure 5.2: Integration of External Package (Webview) and WebView Widget

The Flutter framework enables developers to add external packages which enhance app capabilities. To include image carousels and web views the app uses `carousel_slider` and `webview_flutter` packages.

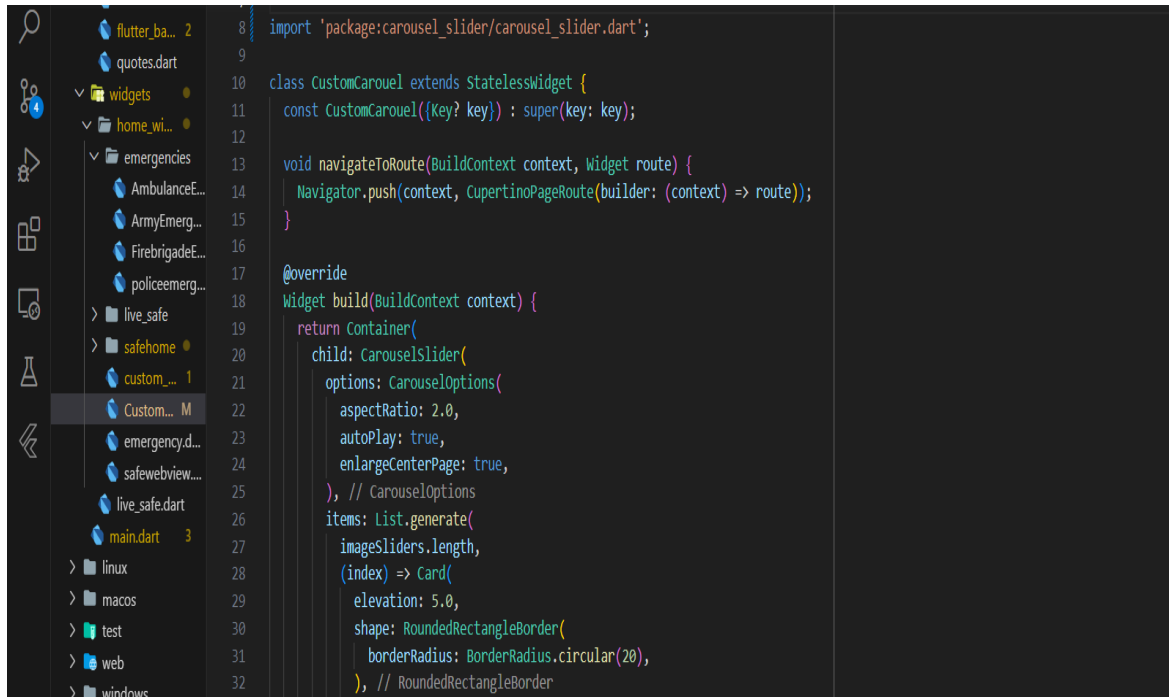


Figure 5.3: Integration of external packages (`carousel_slider`) Widget

The "SafeConnect" app employs a combination of Flutter's default widgets along with custom stylistic design and navigation specifications to create an interactive user experience for its frontend components.

5.3 Backend Development

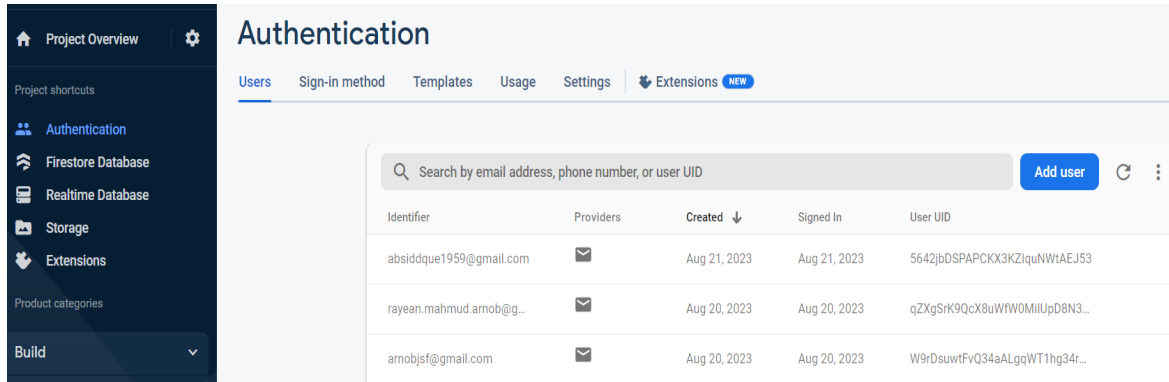
In 'SafeConnect', backend development is supported by Firebase which is a complete platform that enables the implementation of the app's features. Firebase offers a great set of services that comes with user authentication, real-time data synchronization, cloud storage, and serverless functions. It enables secure management and communication, as well as interaction, of data and access to the app's features, between users and its own features.

5.3.1 User Authentication and Data Security through Firebase Authentication

The Firebase Authentication component of the Firebase platform is seamlessly integrated into the "SafeConnect" app to store user data securely. This feature enables the registration and login process while protecting the user's personal data. Data access is also controlled through user authentication, ensuring user privacy and trust within the app.

```
// Firebase Authentication Initialization in main.dart
await Firebase.initializeApp();
```

Figure 5.4: Initializing Firebase Authentication



The screenshot shows the Firebase Authentication console. On the left is a sidebar with navigation options: Project Overview, Authentication (selected), Firestore Database, Realtime Database, Storage, Extensions, and Build. The main area is titled 'Authentication' and has tabs for Users, Sign-in method, Templates, Usage, Settings, and Extensions. Below the tabs is a search bar and an 'Add user' button. A table lists three users with columns for Identifier, Providers, Created, Signed In, and User UID.

Identifier	Providers	Created	Signed In	User UID
absiddque1959@gmail.com	✉	Aug 21, 2023	Aug 21, 2023	5642jbDSPAPCKX3KZlquNWtAEJ53
rayean.mahmud.arnob@g...	✉	Aug 20, 2023	Aug 20, 2023	qZXgSrK9QcX8uWfW0MIUpD8N3...
arnobjsf@gmail.com	✉	Aug 20, 2023	Aug 20, 2023	W9rDsuwFvQ34aALgqWT1hg34r...

Figure 5.5: Firebase Authentication of “SafeConnect” App

5.3.2 Implementation of Contact List Customization using SQLite:

Through SQLite local database functionality “SafeConnect” enables users to control their contact list management. Users can enhance the application’s functionality by adding emergency contacts that they further personalize through the app. Users add trusted contacts which the device then saves efficiently to its local SQLite

```
64 // Adding Contacts using SQLite
65 Future<int> insertContact(TContact contact) async {
66   Database db = await this.database;
67   var result = await db.insert(contactTable, contact.toMap());
68   // print(await db.query(contactTable));
69   return result;
70 }
```

Figure 5.6: Code Snippet of Adding Contacts Using SQLite

database through SQLite. This method enables uninterrupted access to the contact list in conditions without internet availability thereby improving the app’s functionality when critical situations demand it.

5.3.3 Real-time Chat with Guardians using Firebase Cloud Firestore:

Real-time chat functions effortlessly through the integration of Firebase Cloud Firestore in the “SafeConnect” app. Through this active backend functionality users can get instant message updates that go to both themselves and their assigned guardians. Text conversations stored in Firestore collections through user IDs facilitate rapid retrieval across the platform. Real-time communication through this methodology creates fast responses while enhancing both security and user connection.

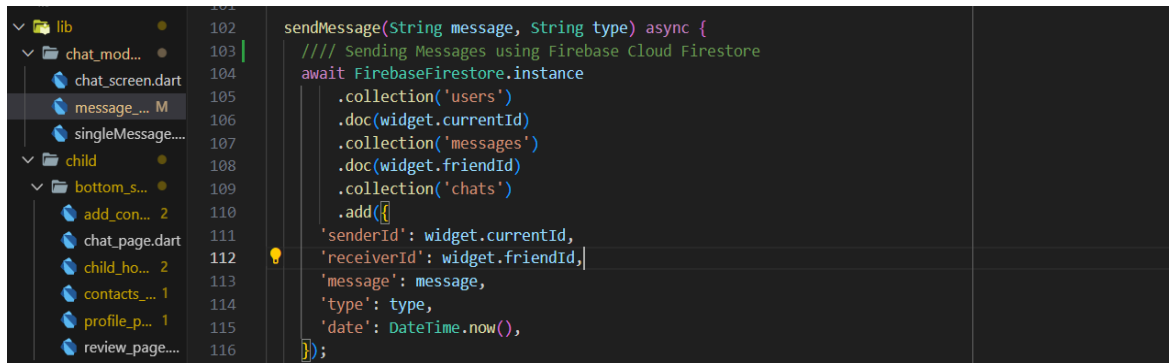


Figure 5.7: Code Snippet of Sending a Message Using Firebase Cloud Firestore

```

date: August 20, 2023 at 6:35:07 PM UTC+6
message: "Are you safe?"
receiverId: "W9rDsuwtFvQ34aALgqWT1hg34rC3"
senderId: "qZXgSrK9QcX8uWfW0MilUpD8N352"
type: "text"

```

Figure 5.8: Stored Message Data in the Firebase Cloud Firestore

5.3.4 Emergency Alert Button, Shake Features (Send Emergency Message):

When the phone is shaken or the Alert Button is pressed `_sendEmergencyMessage` Function will be called. The function performs emergency message transmission that includes user location data.

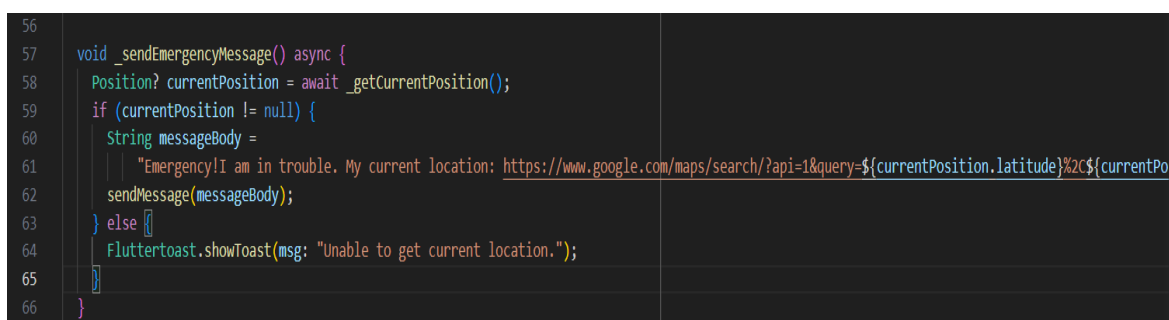


Figure 5.9: Code Snippet of the Emergency Message Function

- `_getCurrentPosition()`: This method uses location services to retrieve the user's present geographical position. When successful, the method returns the user's position as a `Position` object.
- `sendMessage(messageBody)`: Through this method, the system delivers an emergency message to the trusted contact that contains the user's location.

- The `messageBody` variable creates an emergency message containing detailed information about the situation along with a Google Maps link that shows the user's current position.

Overall, the backend development infrastructure delivers complete support for the "SafeConnect" app's purpose of offering safety measures and assistance to users. This application utilizes Firebase services and storage solutions together with customized features, including SQLite, to provide users with a unified interface that ensures operational reliability alongside real-time responses. Both backend development and frontend features merge into a unified experience that protects users while ensuring efficient emergency communications.

Chapter 6

Results and Discussion

The development of SafeConnect led to multiple significant results. Emergency alerts with real-time location sharing through the application's system enabled efficient and quick response capabilities. Users can benefit from secure authentication features acquired through Firebase integration which delivers a straightforward login method. The application displays an interface that users can operate intuitively which leads to easier access functions. SafeConnect ensured multiplatform use by enabling its functionality across Android and iOS. Emergency alerts were optimized for reliability, ensuring timely delivery to designated contacts during distress situations. While SafeConnect offers many advantages there are some limitations to the system. Location-based functions in the system require internet access for operation which impacts its effectiveness when there is no internet connection in particular locations. The creation of SafeConnect demonstrated how the user interface and user experience design together with robust authentication systems and comprehensive platform testing enhance application performance. The acquired knowledge will advance the development of future SafeConnect versions and similar mobile applications.

Chapter 7

User Manual

The user manual gives detailed instructions about the effective utilization of every application feature. The "SafeConnect" mobile application enhances safety through its features which provide emergency assistance and real-time contact with trusted individuals and location-based support. This guide presents an all-encompassing view of app functionality which enables you to harness its protective features for your safety needs.

7.1 Installation and setup

1. After installing the application, kindly ensure the app is granted essential permissions including location, contacts, storage, sms, and notifications to enable its optimal functionality.
2. The user needs to maintain an internet connection to fully utilize location-based features, engage in chat functionalities, access motivational articles, and contribute reviews. However, an internet connection is not required for making emergency calls and managing the trusted contact list.

7.2 Home Screen

The home screen provides quick access to essential features such as emergency calls and emergency services, emergency location services, motivational quotes and articles, safety guidelines, and an emergency alert button.

7.2.1 Motivation Quotes

- On top of the home screen, you will see some inspirational quotes to uplift your spirits.
- Just tap on quotes to view different quotes.

After that, there is a section for emergency services for Police Emergencies, Ambulance Emergencies, Fire Brigade Emergencies and Anti-terrorism authorities.

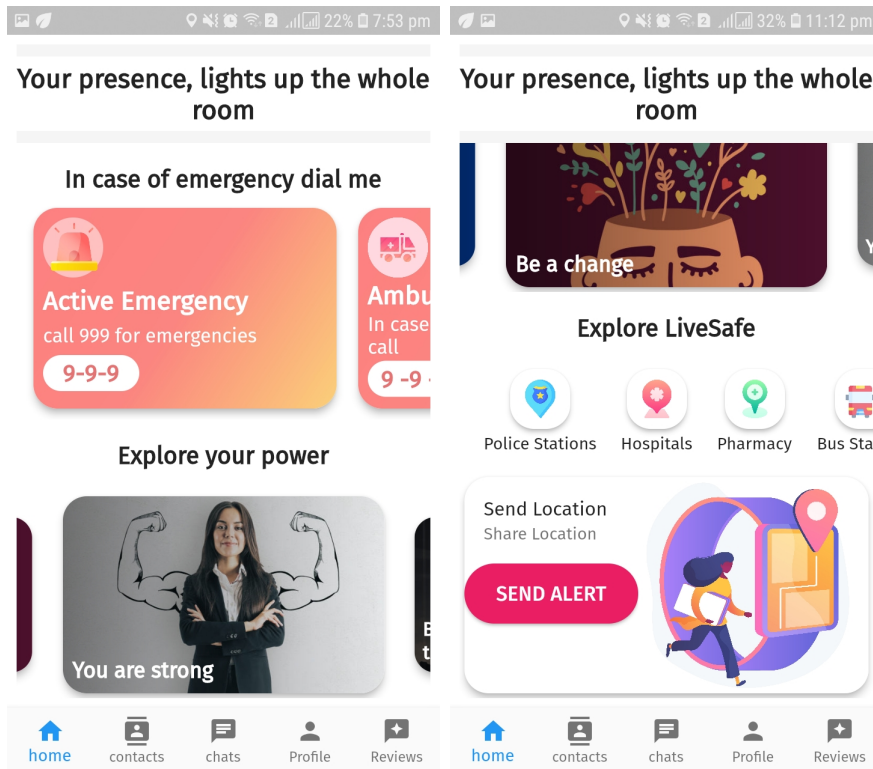


Figure 7.1: User Interface of the Home Screen

7.2.2 Emergency Call

- Each emergency service section provides a dedicated button in every slider to call the respective emergency service. In case of an emergency, you can tap on any slider button and an emergency call will be sent instantly to that emergency number.

7.2.3 Safety Guide and Motivational articles

- Within the following section, you will encounter several sliders, each accompanied by a distinctive title. Tapping on any of these sliders will seamlessly navigate you to either motivational articles or safety guidelines, providing you with essential resources and knowledge on the designated subjects.

Afterward, you'll come across a segment labeled "Explore LiveSafe."

7.2.4 Live Safe (Map Page)

Discover Police Stations, Hospitals, Pharmacies, and Bus Stations Nearby

- The "Live Safe" feature offers convenient access to nearby police stations, hospitals, pharmacies, and bus stations. Simply tap on the corresponding button to visualize the location on the map.

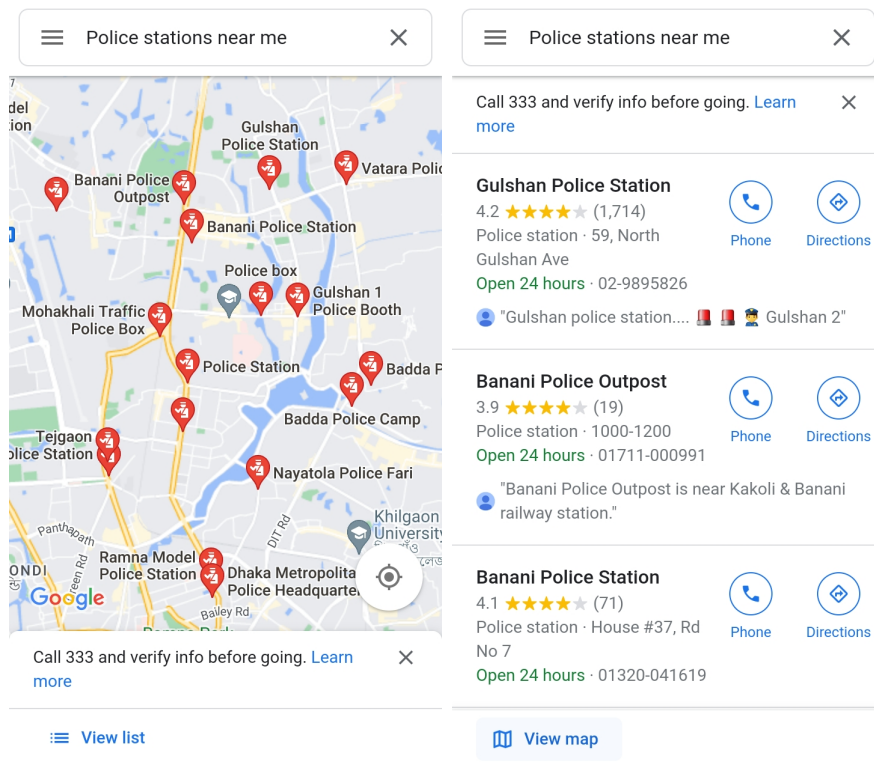


Figure 7.2: Map Page

Following that, a segment is dedicated to sending emergency alerts.

7.2.5 Emergency Alert Message

1. **Activate the Emergency Alert:** Click on the emergency alert slider to bring up a bottom screen displaying two buttons: *"Get Location"* and *"Send Alert"*.
2. **Obtain Your Location:** Tap the *"Get Location"* button to retrieve your current location. This information will be saved in the background for emergency use.
3. **Send an Emergency Alert:** Press the *"Send Alert"* button to send an emergency message to your trusted contact, including your current location.
4. **Quick Alert via Shake Feature:** Alternatively, shake your phone to instantly send an emergency message without pressing any buttons.

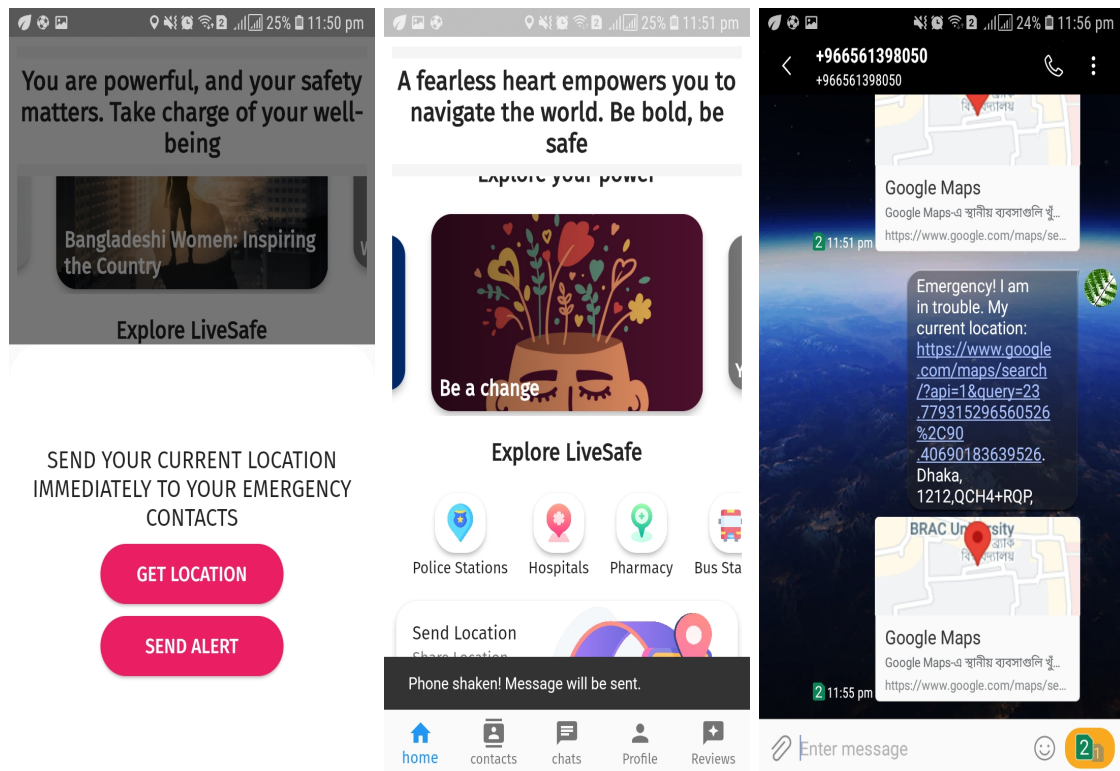


Figure 7.3: Emergency Alert Message

At the lower section of the screen, you will find navigation buttons designed for various features, including the Contact Page, Chat Page, Profile Page, and Review Page. Upon selecting any of these buttons, you will be seamlessly directed to the corresponding page, allowing you to access and utilize the designated functionalities.

7.3 Contact Page

To view the contact page, access the "Contacts" section from the home screen.

Adding Emergency Contacts

1. **Navigate to the Contacts Section:** From the home screen, go to the "Contacts" section.
2. **Tap on "Add Trusted Contacts":** Press the "Add Trusted Contacts" button to initiate the process of adding a new contact.
3. **Search and Select a Contact:** A comprehensive list of contacts will be displayed, along with a search option. Use this feature to quickly locate contacts by entering text input.
4. **Add to Trusted Contacts:** Select any contact from the list to seamlessly include it in your trusted contact list for emergency situations.

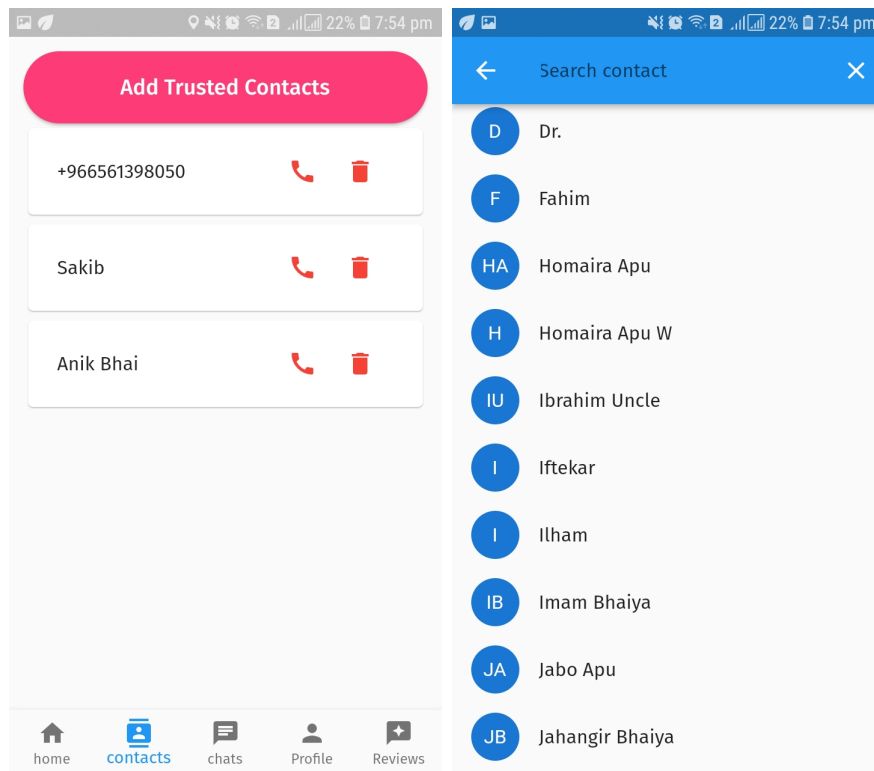


Figure 7.4: Contact Page

Contact List

- Navigate to the "Contacts" section to view the roster of trusted contacts you have added.
- To remove a contact, identify the desired contact and click the delete icon to eliminate it from the trusted contact list.
- To initiate a call to a trusted contact, simply click on the call icon, triggering an immediate call connection.

7.4 User Registration and Login

To get access to the chat features, users are prompted to log in. If you are not yet registered, you must complete the registration process prior to gaining access.

7.4.1 User Registration

1. During the registration process, users have the choice to register as either a child or a parent/guardian. To proceed, simply select the "Register as a Child" or "Register as a Parent" button.
2. Provide your personal information, including your name, phone number, your email address, and either your guardian's or child's email address, as applicable.

3. Complete the registration procedure by clicking the "Register" button, following which you can log in using your newly created credentials.

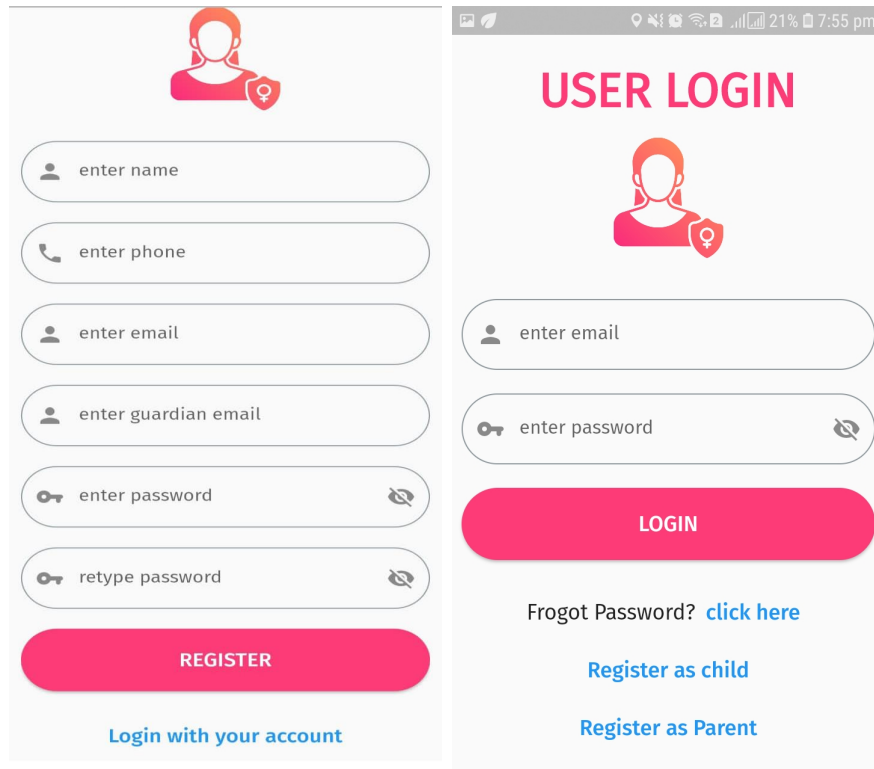


Figure 7.5: Registration and Login Page

7.4.2 User Login

1. If you're an existing user, simply enter your registered email and password to log in.
2. To proceed, tap the "Login" button, granting access to the chat features within the app.

7.5 In-App Chat with a Guardian or Child

1. To experience real-time communication with your guardians or children (as applicable), navigate to the "Chats" section.
2. Select a guardian's or child's name to open the chat interface.
3. Type your message and tap the send icon to communicate with your guardian.
4. For versatile messaging options, click the plus icon. Share your location by clicking the location button, capture and send real-time photos by using the camera, or transmit images from your gallery by clicking the photo button.
5. Swipe right or left to remove messages

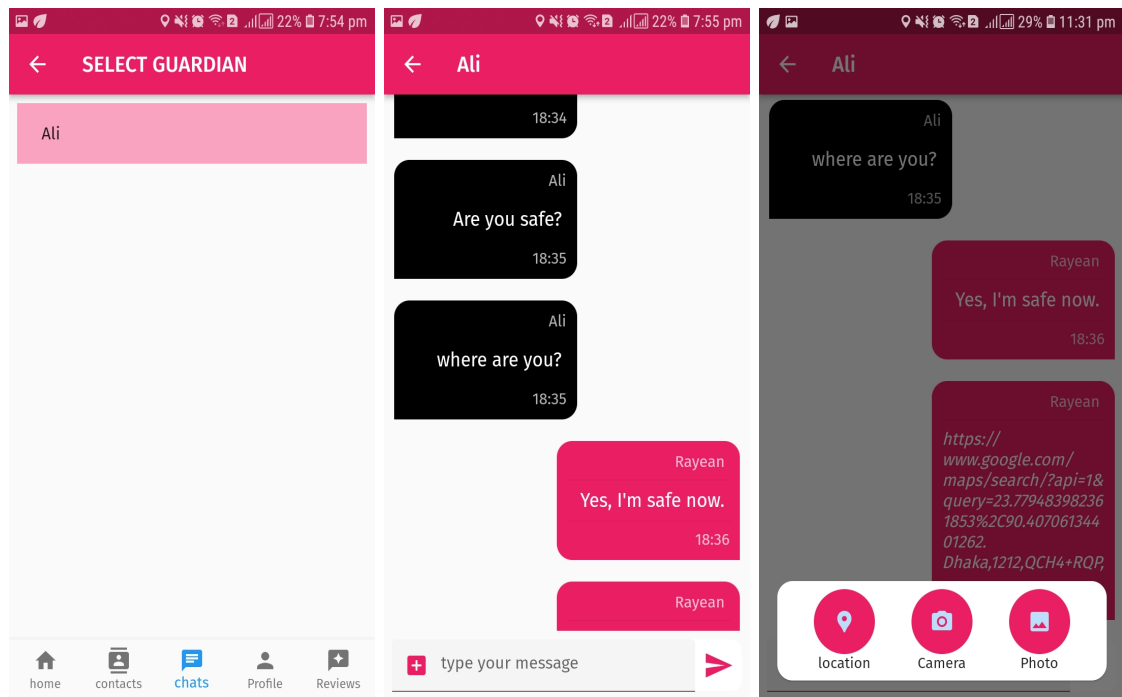


Figure 7.6: In-App Chat Functionalities

7.6 Profile Page

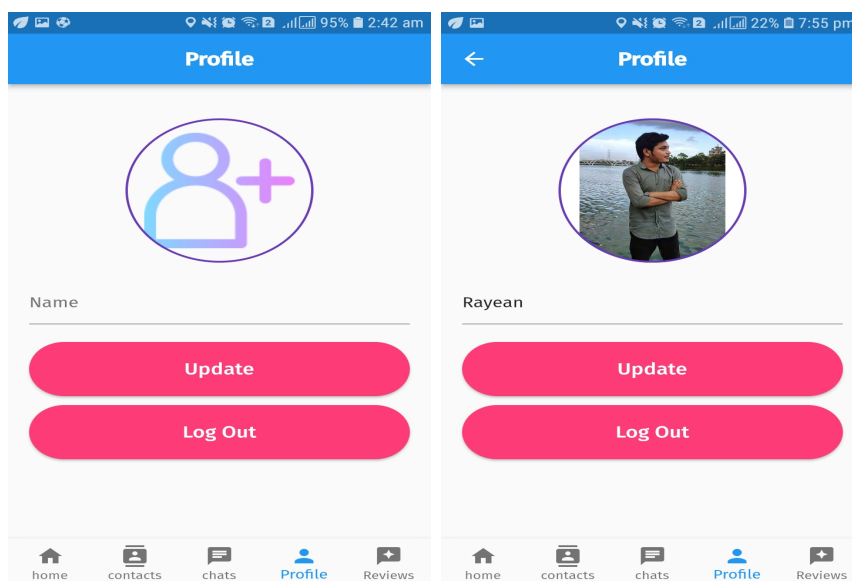


Figure 7.7: Profile Page

Profile update

- Update your profile picture by tapping on it and selecting an image from your gallery.
- Update your profile name through the text input field.
- Click the "Update" button to save changes.

Logout

- logout by simply clicking the logout button.

7.7 Review Page

Search Reviews

Effortlessly search for reviews of specific locations using the search field at the top of the screen.

Add Reviews

Share your insights and experiences by adding reviews using the following steps:

1. Click the *"Add"* button to open a new screen.
2. Input the location and your comments in the provided text fields.
3. Click *"Save"* to contribute a new review anonymously.
4. Clicking *"Cancel"* will seamlessly navigate you back to the review list.

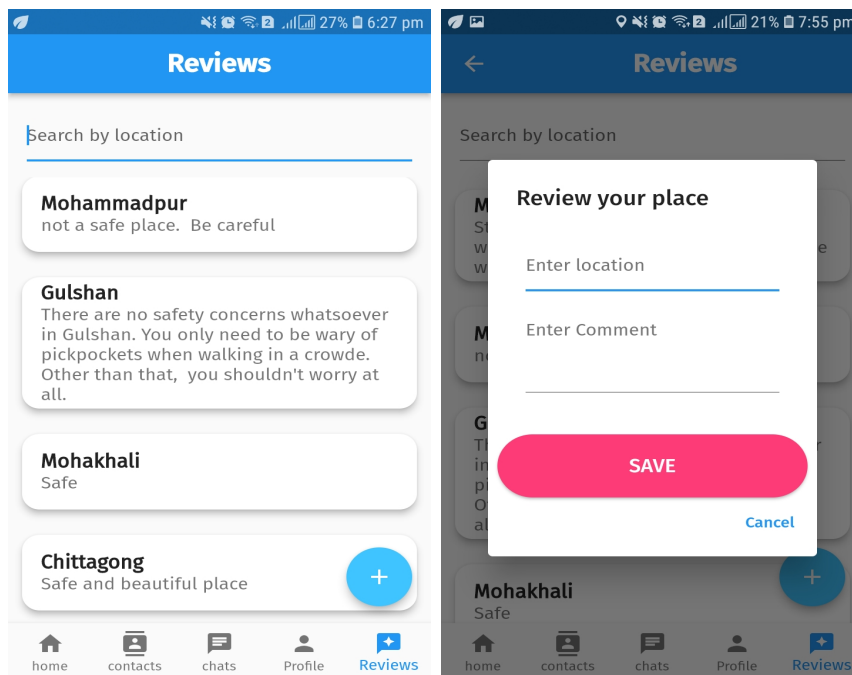


Figure 7.8: Review Page

Chapter 8

Conclusion and Future Work

8.1 Summary of the Work Done

The SafeConnect project was developed as a real-time emergency alert and connectivity application that utilized instant location tracking and emergency alert messaging functionalities to promote user safety. The application was designed and implemented using Flutter, Firebase, and Google Maps API, ensuring a cross-platform experience for both Android and iOS users. User authentication combined with real-time location sharing and emergency alerts made up the essential modules which successfully integrated into a reliable system that provided users with an intuitive emergency communication platform. The system underwent extensive tests to achieve maximum performance alongside security improvements and user experience enhancement.

8.2 Key Contributions and Impact

The SafeConnect application established remarkable achievements within emergency alert systems through its lightweight platform, which provides efficient user security enhancements. Key contributions include:

- **Real-Time Emergency Alerts:** The system provides instant emergency messages to crucial emergency contacts that help prompt rapid assistance during emergencies.
- **Secure Authentication and Data Management:** Firebase Authentication and Firestore enable a secure user management system at a scalable level.
- **Optimized Location Tracking:** The implementation of background location updates ensures continuous monitoring without excessive battery drain.
- **User-Friendly Interface:** A well-designed UI enhances usability, making it easy for users to send alerts and share locations seamlessly.

The developed system has potential benefits for users who need emergency help alongside organizations seeking dependable, budget-friendly emergency communication methods.

8.3 Recommendations for Future Enhancements

The advancement of technology requires the development of expanded device support as a critical component. The adoption of wearable devices as a setup for smartwatches and fitness trackers would enable users to activate emergency alerts directly from their wearable devices providing instant access to emergency services during critical moments. Additionally, through AI-powered voice recognition, the integration of voice-activated emergency commands could allow users to send hands-free emergency alerts. The feature would bring convenience to emergency situations where users cannot perform manual actions. A multi-language support feature could also be introduced to make the application more accessible worldwide, allowing users to interact with the system in their preferred language.

A community-based emergency response network could be developed to improve the system's effectiveness in large-scale emergencies. This system enhancement enables users to obtain help from verified responders located nearby their position. These functions would find their greatest usefulness in both public safety operations and times of disaster. Finally, the integration of local emergency services through third-party APIs could automate dispatch processes which combine to produce faster responses from police and medical staff.

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