Lifeo: AI-Based Voice Recognition Safety App for Women and Children

Kiran
Department of MCA
GLBITM
Greater Noida, India
kiranglbitm@gmail.com

Dr. Sanjeev Kumar
Department of MCA
GLBITM
Greater Noida, India
sanjeev.kumar@glbitm.ac.in

Abstract: Criminal incidents against women and children are increasing day by day in cities and semi-cities, and this demands prompt emergency support. Current safety applications do not serve the purpose and require internet connectivity to work

The basic concept underlying this application is to allow users who need help to do so conveniently without having to physically interact with their device. The use of a variety of methods to generate an SOS message has been done through the use of a set process, with Safe Mode and Unsafe Mode being two of the options. When it comes to Safe Mode, the user can initiate SOS messages through either a tap-based SOS button or through chat keywords. As far as Unsafe Mode is concerned, this feature involves listening for specific voice commands like 'help', 'bachao' and 'danger' that would be picked up by AI-based voice recognition technology. This helps the user send out an SOS without physically interacting with their device. An SOS message would cause the application to send a location to pre-determined contacts using SMS.

The app comes equipped with an intuitive graphical user interface that facilitates switching between modes and sending out emergency alarms. It was built using Android Studio employing Java and XML programming languages to enable quick voice command recognition, accurate location detection, and immediate SMS messaging.

This application aims to provide a functional and practical approach to increase accessibility and minimize response times.

Keywords-: Women Safety, Emergency SOS, Voice Command Detection, GPS Tracking, SMS Alert System, Dual-Mode System, Mobile Safety Application

1. Introduction

In today's dynamic environment, safety has been one of the major issues for everyone. In today's era, the number of harassment cases and assaults on women and children is very high [1]. There is an urgent need for technology to provide an answer to such a safety issue that people have to face. Whether it is a case of women who travel alone or any child facing a problem due to being in a strange environment, the issue of not feeling safe has emerged as a very critical issue. Though many steps have been taken by the governments and organizations, yet traditional methods of ensuring safety are not enough.

Thanks to the development of smartphones, it has been possible to create applications for mobile phones that do more than simply generate alarms. Such applications offer instant messaging capabilities, immediate alarm triggers, and instantaneous location sharing services [2]. The Lifeo: Voice-Enabled Safety Application we have chosen aims to provide a simple and efficient safety tool. This is not a mere SOS application; rather, it is an organized system with different options for activating emergencies.

The concept for this application is motivated by the real-world scenario of individuals being unable to physically interact with their smartphones when they find themselves in difficult times [3]. An application that could recognize voice commands and other gestures would prove invaluable in such circumstances. The application employs two modes of operation called Safe Mode and Unsafe Mode. The Safe Mode allows users to activate alarms by pressing the SOS button or sending certain keywords through chat interfaces. The Safe Mode allows users to activate alarms by pressing the SOS button or sending certain keywords through chat interfaces. The keyword-based triggering mechanism is demonstrated in Fig 6.
However, the Unsafe Mode will allow users to activate alarms using voice commands like "help," "bachao," and "danger." The Safe Mode and Unsafe Mode functionality described above is visually represented in Fig 3 and Fig 4 respectively.
The major highlight of this software will be its ability to send the user's location to the designated contacts through GPS. In contrast to other software solutions that require constant internet connectivity, this software uses SMS service to send out the alerts. After an alert is raised, the system automatically reaches out to the registered contacts for prompt assistance. The process of sending location and alerts to emergency contacts is further supported by the interface shown in Fig 5.

In terms of the programming and coding process, the software will be created using Android Studio with the use of Java and XML programming languages. This software solution will use voice commands recognition as well as GPS to track location of the user. Also, the SMS will play a pivotal role in sending alerts to the contacts. The software responded promptly to user requests, and the alerts were delivered without fail. The software's ability to respond to manual triggers, chat messages, and voice commands makes it versatile enough to be used under various circumstances. Simplicity and effectiveness characterize our product's design, which makes it perfect for practical applications.

We have created an application that can address practical problems in everyday life. This tool allows users to benefit from mobile devices, which most people own, by incorporating a step-by-step process and several triggering techniques, which improves their safety and speeds up their response in emergencies. Although no system can guarantee complete protection from potential threats, quick access to assistance can help in such cases. The overall objective and working concept of the proposed application is illustrated in Fig 1.

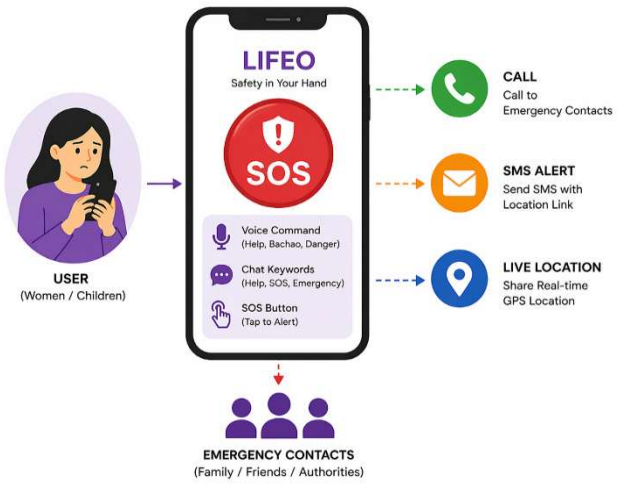

Fig 1: Application Objective

2. Related Work

There has been considerable research conducted and mobile applications developed aimed at increasing the safety of women and children while using mobile devices[4]. The existing solutions primarily concentrate on offering support in emergencies using alerting facilities, communication facilities, and GPS location tracking [5]. Despite the usefulness of such applications, there are certain usability and reliability issues that affect their performance during emergencies [6].

Among all the existing solutions, the use of SOS or panic button facilities has become common practice [7]. Users can notify their pre-defined contacts of their emergency situation with just a click of a button [8]. However, the process is completely reliant on the manual triggering process. In some cases, users may be too panicked or unable to use their mobile devices [9]. Some systems have come up with trigger mechanisms based on chats or keywords. Here, users are able to type in certain keywords like “help” or “danger” to trigger an emergency alert [10]. Although the chat mechanism eliminates the reliance on buttons, it still demands user involvement and hence cannot be used where no hands are free [11].

Voice command systems can be considered to be more sophisticated because they allow hands-free operation [12]. Voice command systems make use of pre-defined voice commands to trigger alarms [13]. Even though they have improved upon earlier systems, most voice systems are dependent on internet connections and background noise affects them adversely [14].

Location tracking is a fundamental part of any safety application [15]. Many systems use GPS as well as internet services to track the user's location and inform emergency contacts of their location [16]. Nevertheless, their reliance on internet connection makes them less effective in areas where internet service is absent or unavailable [17].

While the above features can be considered an improvement, there is still room for enhancement of the system by offering a flexible and functional trigger mechanism as well as offline capabilities [18]. Most of the current applications are only able to use one mechanism of trigger or cannot function in the absence of internet service [19].

The proposed safety application offers two different modes: Safe Mode and Unsafe Mode. These modes include various types of triggers for activation of the application: tap-based activation of the SOS button, keyword-based activation during conversations, and voice commands through AI voice recognition. Moreover, the application relies on GPS for location tracking and SMS services for sending alerts regardless of whether the internet service is available or not.

3. Methodology

Designing of the application is done through an architectural approach that is modular and easy to understand, guaranteeing speediness and efficiency in times of emergencies. The architectural approach is aimed at minimizing the time used by the users in order for the alert systems to be triggered easily using various inputs. The basic building blocks of the design include four logical layers:

A. System Design and Architecture

The software is developed using a modular approach, and it is designed to react fast and be convenient to operate when an emergency situation arises. Little interaction from the user is required, and the application enables activation of emergency actions through various modes of input. The software consists of four layers for optimal performance and reliability.

The first layer is the User Interface Layer, which consists of an interactive interface that makes it possible for the user to navigate through different options like switching from safe mode to unsafe mode and triggering emergency actions. The second layer is the Input Processing Layer, where inputs received from the user are processed. These include pressing the SOS button, typing keywords, or using speech commands to alert an emergency.

The Decision Layer processes the user's selection of either the Safe Mode or Unsafe Mode and triggers the corresponding response. Finally, the Communication Layer alerts emergency contacts using calls and SMS messages, which contain the user's location details. The overall system architecture of the application is illustrated in Fig 2.

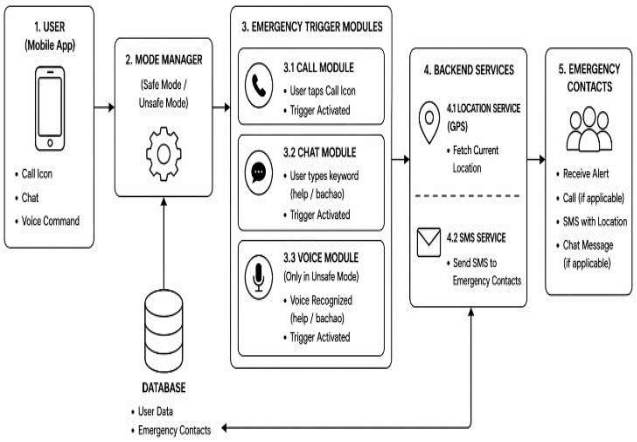

Fig 2: System Architecture

B. Technology Stack

The application is created using the tools provided by Android Studio, with the help of Java and XML languages for coding. It uses the Android Software Development Kit for creating the user interface and other components, whereas the Speech Recognition API is used to recognize speech-based commands such as "help," "bachao," and "danger." The application makes use of GPS services for getting the user's current location information, whereas SMS Manager is used to send text messages to the contacts in emergencies without the need of an internet connection.

C. Components of the System

The system is comprised of several important elements that function collectively to make the emergency response efficient. The User Interface Module controls the interface for users, and the Emergency Contact Module keeps the information of the registered contacts. The Triggering Module activates the system through the use of the SOS button, certain chat triggers, and voice command activation. The Location Module records the geographical location of the user during an emergency situation, and the Alert Module dials out emergency numbers and sends out SMS notifications to select contacts.

D. Workflow of Implementation

The system starts by initiating user input where the user opens the app and chooses between Safe Mode and Unsafe Mode. In Safe Mode, there will be manual triggers such as pressing the SOS button and using particular keywords in chat messages, while in Unsafe Mode, there will be voice recognition in addition to the manual triggers.

After detecting user inputs via tapping, chat, or voice commands, the triggers will be activated, which will initiate the emergency response sequence that involves making a phone call and sending an SMS with the user's location to the emergency contact numbers. Using SMS makes sure that the application can operate offline. The workflow of implementation of the application is illustrated in Fig 2.

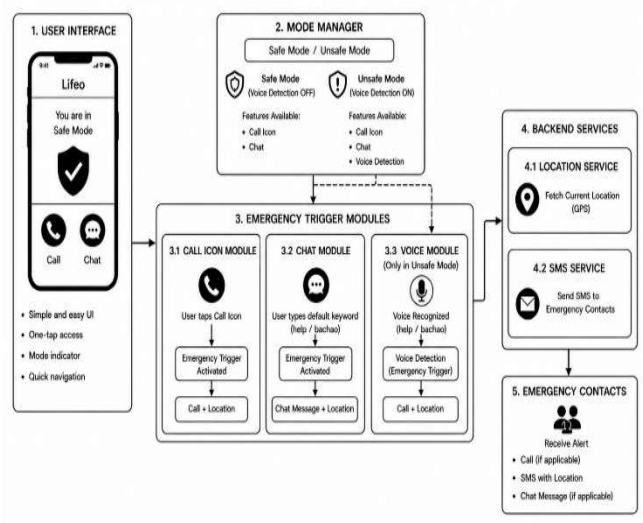

Fig 3: shows the workflow of implementation of the proposed system

E. User Interface Design

The user interface of the app has been designed to make sure that its usability in case of emergencies is easy, intuitive, and efficient. There are several screens in the application, which allow for easy access to safety tools.

Home Screen: It shows the mode of the user whether Safe or Unsafe, and users can switch between these two modes using an onscreen button. The Safe Mode interface and Unsafe Mode interface is shown in Fig 3, Fig 4.

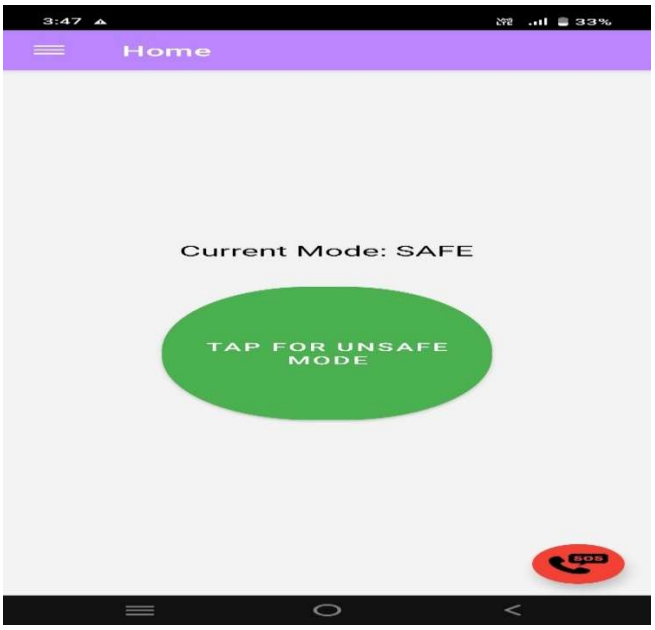

Fig 4: Home Screen showing Safe Mode

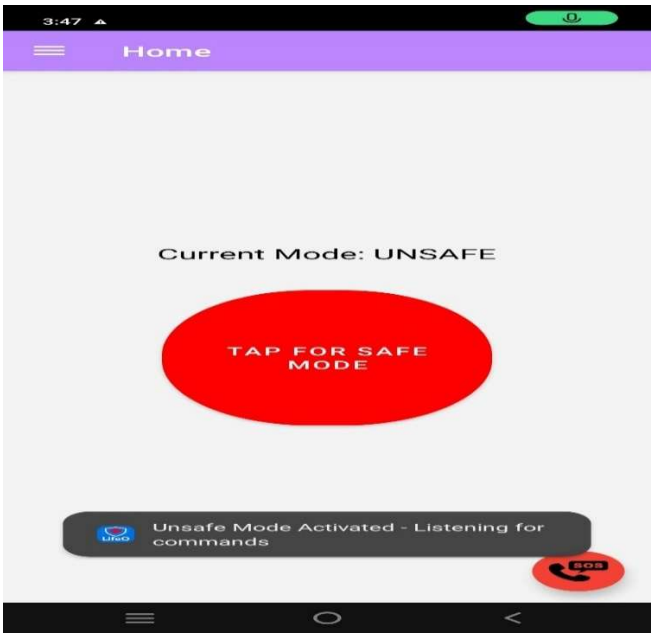

Fig 5: Home Screen showing Unsafe Mode

Members Screen: It is a place where users can add their contacts as well as their contact details (Name and Phone Number). The emergency contact management screen is shown in Fig 5.

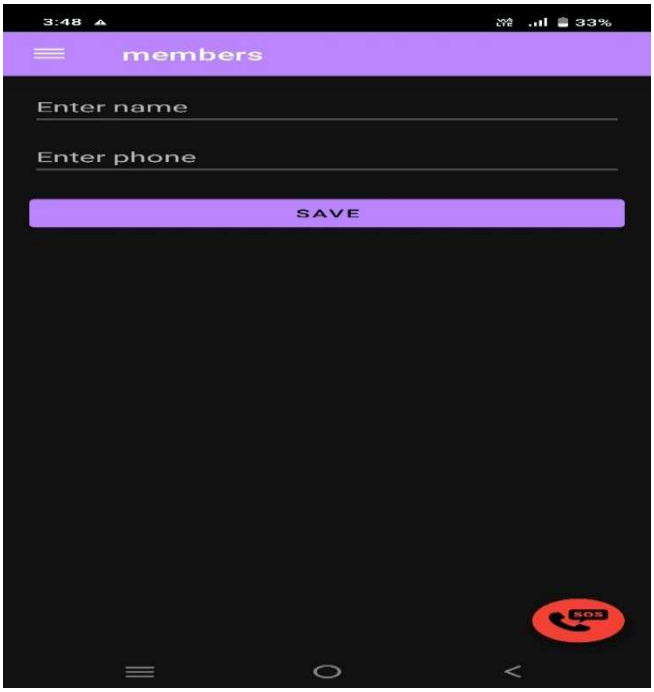

Fig 6: Members Screen for adding emergency contact

Chat Screen: It has some pre-set keywords for emergencies including "help", "bachao", and "danger". The chat-based keyword triggering interface is shown in Fig 6.

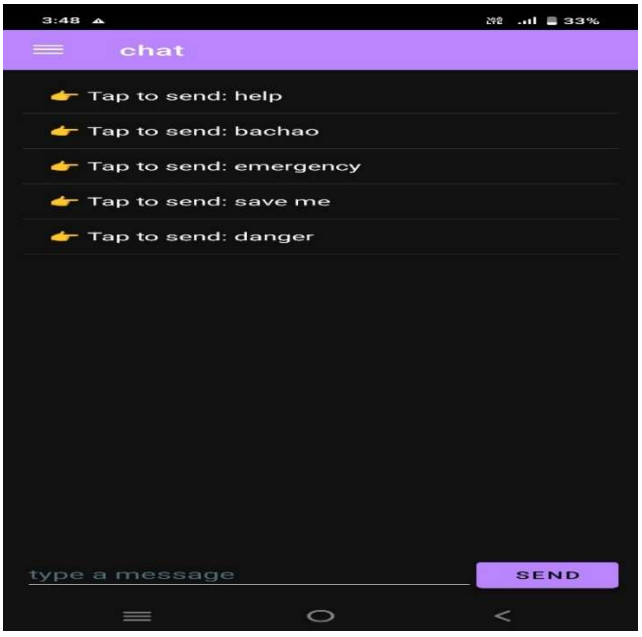

Fig 7: Chat Screen displaying predefined emergency keywords

Help Screen: It helps the users know the usage of Safe Mode and Unsafe Mode. The help and guidance screen explaining application usage is shown in Fig 7.

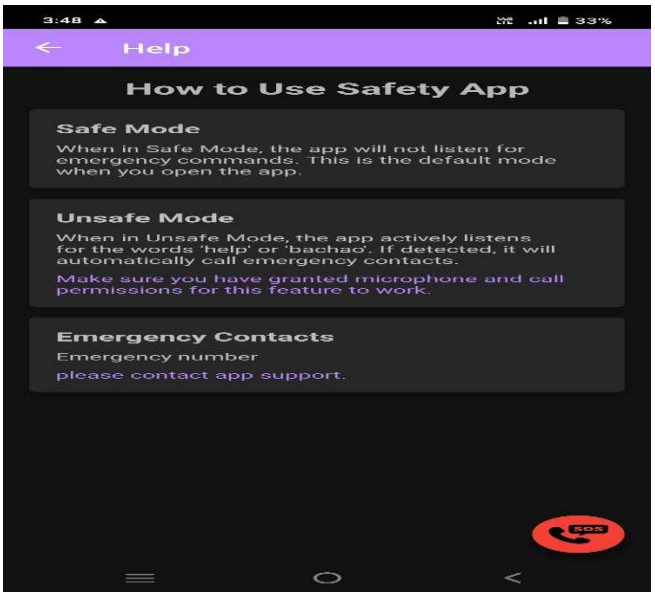

Fig 8 : Help Screen explaining the functionality of Safe Mode and Unsafe Mode.

Navigation Drawer: Enables easy navigation between different sections of the app. The navigation structure of the application is represented in Fig 8.

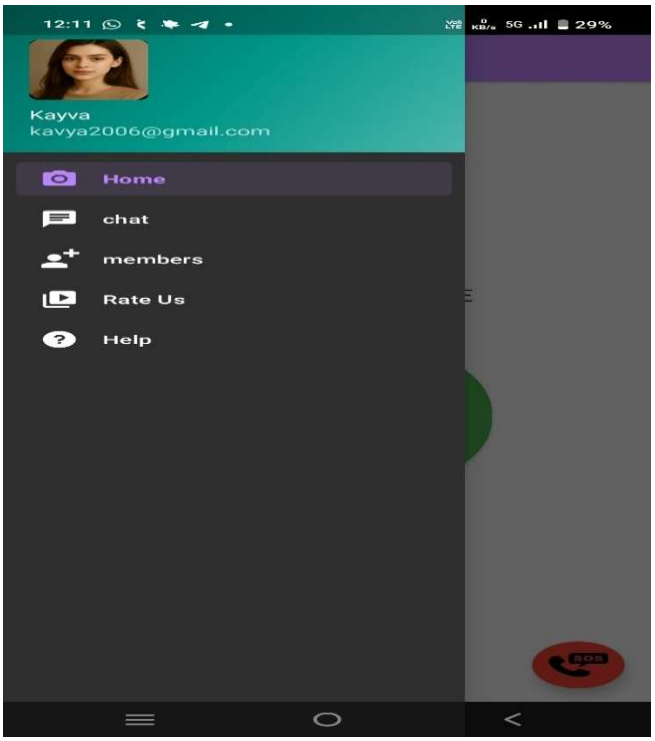

Fig 9: Navigation Menu

These user interface elements make sure that there is easy interaction in emergencies.

4. Results

In order to test the effectiveness and applicability of the suggested security application, various functional tests were performed on the application. The primary functions of the application were tested using several parameters including the time taken to respond to an SOS call, detecting voice commands, sending alerts via SMS, and the accuracy of location detection through GPS. The tests were carried out in both urban and semi-urban areas with varying degrees of network connectivity. The performance analysis of different alert mechanisms is illustrated in Fig 9.

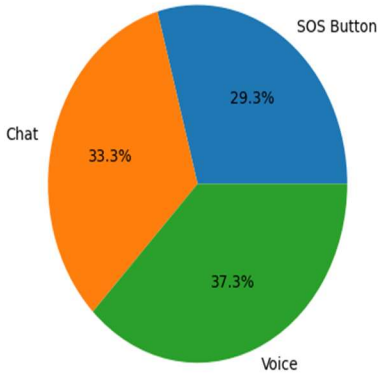

Fig 10: Alert Response Distribution

The effectiveness of SOS alerts was measured using different activation modes such as manual activation through the SOS button, chat keywords, and voice commands. Manual SOS activation proved to yield the quickest response, taking roughly 2.0 to 2.5 seconds before the emergency call would be made. Chat SOS alerts were similarly effective; however, there was a brief lag due to keyword recognition. The same is true for voice SOS activation; it took 2.5 to 3.0 seconds to make an emergency call based on noise conditions.

In addition, the accuracy of the GPS module was tested under various conditions to determine its accuracy rate. In different test scenarios, it was found that the average deviation of the location in open spaces was approximately 3 to 5 meters. However, when used indoors or in locations with obstacles, the deviation was higher at 6 to 8 meters.

The accuracy of the GPS module under different conditions is shown in Fig 10.

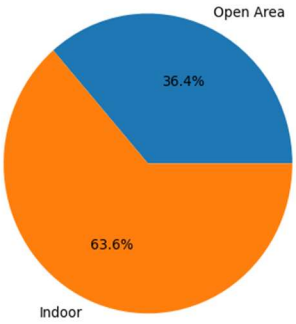

Fig 11: GPS Location Accuracy

Tests of the SMS alert delivery system were carried out with different network environments. The application managed to deliver the SMS messages in less than 3-5 seconds in standard network environments. In poor network environments too, the system performed consistently since it did not require internet connectivity for communication.

Tests for user usability were conducted on a number of users to assess how easy and efficient the system is to use. Most users found the application quite efficient due to the two modes – the Safe mode and the Unsafe mode. The user satisfaction and usability analysis is presented in Fig 11.

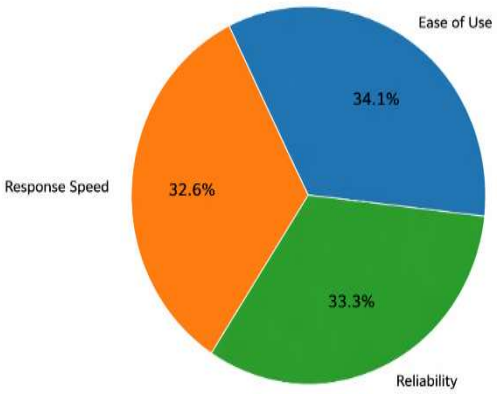

Fig 12: User Satisfaction Analysis

Further tests were also conducted for the performance of the system under stress. Network failures did not hamper the operation of the application; however, there was a delay in the processing of the messages because of poor network environments. The system continued to perform effectively since SMS messages were used for communicating emergency alerts.

5. Discussion

This safety app is an effective way to improve the safety of women and children using a convenient and straightforward mobile-based approach. The inclusion of various triggering features such as an SOS button, chat-based keywords, and voice commands enables the user to access help regardless of the situation, even if manual interactions are limited or restricted. The Safe and Unsafe modes in this dual-mode safety application also improve usability since users can freely use the application manually and automatically depending on their surroundings.

Unlike typical safety apps that solely depend on manual input, the current system allows the user to send alerts using various methods such as chat-based input and voice commands. These capabilities increase the possibility of sending alerts effectively, making the proposed application more flexible and adaptable compared to other conventional safety apps.

With respect to reliability, the application gains greatly from the utilization of GPS technology and the use of SMS for communicating within the system. In contrast to several current applications that largely rely on internet access, the proposed system will ensure that alert messages are received regardless of the signal availability. This will make the application more useful and reliable, particularly in rural settings.

One major advantage in the use of the proposed system is related to user interaction. First, the application is simple and intuitive to use, making it easier for users to utilize its services easily. Secondly, there are different means through which users can trigger the alert messages.

However, several drawbacks emerged when using the system. First, detecting voice commands may be compromised by background noises that could potentially lower the accuracy of its operations. Moreover, constant voice monitoring in Unsafe Mode may cause excessive battery use. Such drawbacks show that further refinement is needed in order to increase efficiency.

All in all, the system is highly usable, reliable, and adaptable. Using various modes and offline communication in the system makes up for the major deficiencies in current safety systems. The overall performance evaluation of the proposed system is summarized in Table 1.

Table. 1: Performance Evaluation of the Proposed Safety Application

Feature	Avg. Response Time	Success Rate
SOS Button Activation	2.0 – 2.5 seconds	98.5%
Chat Keyword Detection	2.3 – 2.7 seconds	97.8%
Voice Command Detection	2.5 – 3.0 seconds	95.2%
SMS Alert Delivery	3.0 – 5.0 seconds	99.0%
GPS Location Accuracy	3 – 8 meters	96.5%

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