

GoFearless: A Safety and Security Android Based Application for Women

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Abstract: In today's world, savagery against women has developed at an alarming rate considering the startling and dishonorable episodes around us. For different purposes, women got to travel alone in public transport to known or even obscure areas, at night as well. Moreover, they confront sexual badgering, eve-teasing, kidnapping, and whatnot. From the social, psychological, and legal points of view, these phenomena have significantly affected people from all sectors. For the last couple of years, the utilization of GPS navigation equipped with smartphones has extended significantly. Thus a smartphone can be utilized proficiently for individual security or other security purposes. This paper represents an android application entitled "GoFearless" that can protect ladies from hazardous circumstances so that they can feel courageous while traveling or getting to work every day. It is an android app with unique features such as instant cautioning the trusted contacts in conjunction with user location with three emergency trigger buttons- Panic, Cautious, and Update. Besides these, there are other options like addresses of adjacent police stations, police contacts, one-tap call to a national crisis number, recording and saving the surrounding phenomenon for future evidence purposes, etc. This app is developed in Android Studio utilizing Java Development kit, thus acting as a defender, taking after the user until they feel secure.

Keywords: Violence Against Women, Public Transport, Smartphones, GPS Navigation, Android Application, Alert, Emergency Trigger Button, Java

1. Introduction

Women represent half the population of a country and a country must guarantee the fundamental human right for them, which is security. It is an infringement of this right if savage acts like assault, badgering, rape, harassment, bullying, or despicable comments are solely committed against women. Violence against females, as per the United Nations, is considered an act of gender-based savagery that generally tends to cause sexual, physical, or mental harm or suffering to women, along with psychological abuse, constraint, or subjective exclusion of freedom, whether that be in publicly or privately [1]. According to the most recently accessed estimates from the World Health Organization (WHO), nearly one-third of all women (35.6%) have encountered physical and/or sexual relational abuse or non-partner sexual

assault at some stage in their life [2]. Overviews show that most ladies who use public transport feel exposed to physical or verbal animosity, sexual harassment, and other forms of viciousness or unwelcome behavior, driving to individual stress and physical hurt. Gender-based violence kills and cripples more women between the ages of 15 and 44 than cancer, dengue, accidents, and battle combined [3].

As women depend on public transport for getting to work, education, and other public services, making it difficult for them to be mobile moreover fortifies inequality.

In Bangladesh, gender-based violence has drastically increased, particularly in public places, over the past few years. This has led to assisting the limitation of women's mobility [4]. The situation is more extreme on public transportation where millions of ladies are being victimized in their daily life. At a time when more and more women are breaking down societal and familial barriers to pursuing

school and career, a large percentage of women (94%) surveyed have reported harassment on public transportation [5]. 20.5% of women have stopped utilizing public transport. Subsequently, there ought to be a system to secure them in such circumstances. So, after examining a few journals [6-9] we developed a system that includes a smartphone, a device that practically every woman carries with her all of the time. Based on security protocols and keeping that in mind, an app has been developed (and is still in the phase of development) to assist women in such circumstances.

This paper describes such an android based app named “GoFearless”. It works both online and offline. The Panic button will be triggered just by shaking the device thrice and will create a high pitch alert sound and won’t stop even if the phone is locked. The Cautious button will track the current location and give the option to share it whether on social media like FACEBOOK, MESSENGER, WHATSAPP, or via SMS to pre-registered contacts on the device. The update button is to send updates about your current situation, vehicle number, nearby locations, if you are in a safe place, etc. Appropriate use of this app can save a victim in danger by locating her and bringing the culprit into the hands of justice.

2. Literature Review

We looked at a few programs for Android platforms that provide similar or comparable administrations as part of the literature review. [10]. The goal is to figure out how these apps work and how they may be upgraded. Transgressions against women are becoming more widespread. In these kinds of situations, a smartphone is extremely important to a woman’s protection. At the moment, Android is operating on a few apps for the safety consciousness of women.

Hollaback [11] was created to dodge road badgering. It snaps a picture of the harasser and uploads it to the database. The disadvantage is that there is no prompt offer of assistance, and so no self-protection. In the event of a threat, the victim may not have enough chance to take a photo of the assaulter. When the control button is tapped two times, VithU [12] starts tracking the user’s location and relaying it to the authorized recipients every 2 minutes. In the event of a major crisis, it sends a warning to one of the registered contact numbers. The stumbling block is that it lacks capabilities such as abstracting data about surrounding police stations and urgent care centers. Fight Back [13] notifies authorized contacts by Email and SMS that the user is facing inconvenience. In situations of danger, Raksha [14] broadcasts a loud buzzer including the user’s current position to authorized contacts. It sends an SMS alert if there is no internet connection accessible. Street Safe [15] will call a community to get help. An alert call is made by pressing certain buttons. Updated location is posted on Facebook and sent as a message to unlisted phone numbers. B-safe personal safety app [16] makes an SOS call to the guardians, selected by the user herself in situations of emergencies. Safetipin [17] app tracks location via GPS, and shows directions of a safe place as it distinguishes between secure and hazardous zone.

Usability models that are currently operational: Nielsen

[18] distinguished five traits of convenience:

- 1) Efficiency: Assets used concerning the precision and completeness with which clients accomplish objectives.
- 2) Satisfaction: Flexibility from inconvenience, and positive states of mind towards the utilization of products.
- 3) Learnability: The framework ought to be simple enough to understand so that the client can quickly get things done with the system.
- 4) Memorability: The framework ought to be simple enough to keep returning users after some time, not having to learn everything all over again to utilize it properly.
- 5) Errors: The system should have a high degree of precision as then users may recover quickly if they make a few mistakes while using it. Furthermore, catastrophic errors must be avoided.

In addition to this, Nielsen characterizes Utility as the capacity of a framework to meet the wants of a client. He does not consider this to be part of convenience but a separate quality of a system. If a product comes up short to supply utility at that point it does not offer the highlights and functions required; the ease of use of a product becomes excess because it will not permit the user to attain their objectives.

3. Methodology

This app consists of mainly three tasks. We have a user with his/her smartphone by which the user sets GPS on, from which the current location of the user will be fetched. The next module is triggering the panic button if that setting is enabled. Then the third and final task would be to send the location along with the contents to the saved contacts. But before that, there are a few sub-tasks like the user having to be logged in to the application, and saving trusted contacts and social media details on settings. If the triggering setting is disabled then the user has to press buttons to start the process. The photos and voice recordings will be saved in the database. The database contains all of that information and they are ready to be fetched and processed.

This application can perform major high-level functions characterized for a security app which are:

- 1) Registration Page: The user enlists herself by giving her name, e-mail address, password, emergency contact number, required social media account data, and access rights.
- 2) Login Page: The user can log in by substantial e-mail id and password.
- 3) Panic, Cautious, and Update button settings as per user requirement.
- 4) GPS tracking and fetching location to send registered contacts.
- 5) One tap SOS call to national security number, nearest police stations.

3.1. Class Diagram

As in Unified Modeling Language (UML), a class diagram is a form of a static structure diagram that depicts the architecture of a system by displaying the system’s classes, attributes, operations (or functions), and connections among entities.

3.2. UI Flow Diagram

The UI (user interface) flow diagram of this application is ordinarily utilized for one of two purposes. To begin with,

It's utilized to demonstrate the interactions that the user has along with the application, as characterized in a single-use case. For illustration, a use case can allude to a few screens and give knowledge into how they are utilized [19].

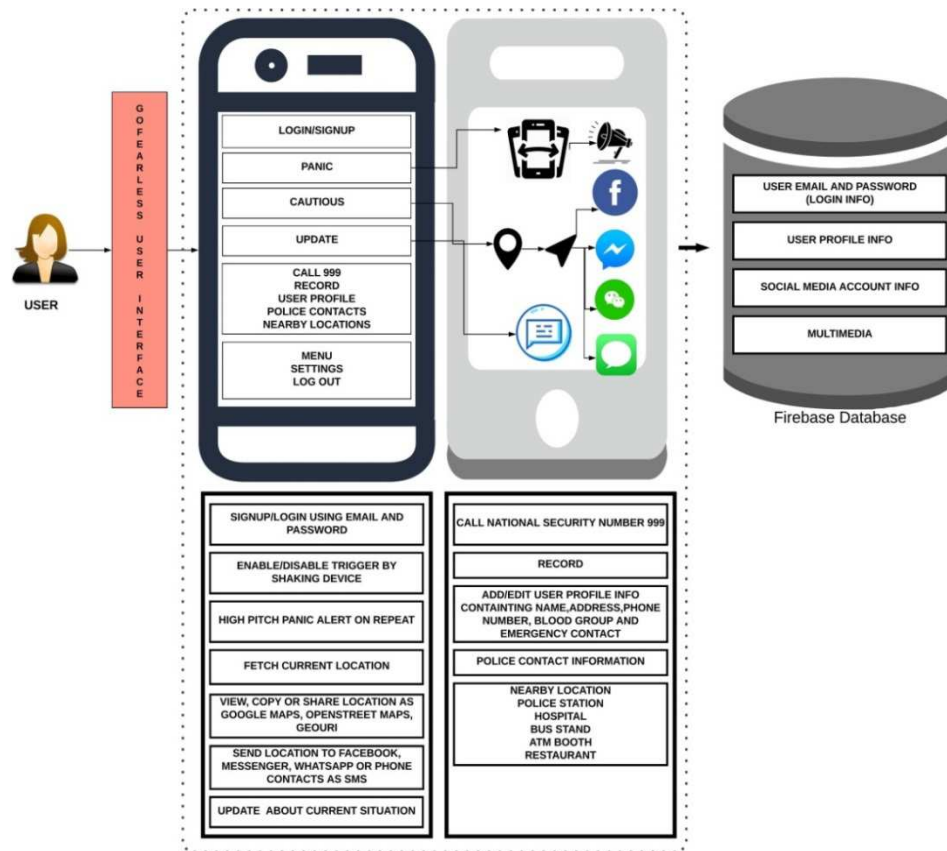


Figure 1. The System Architecture.

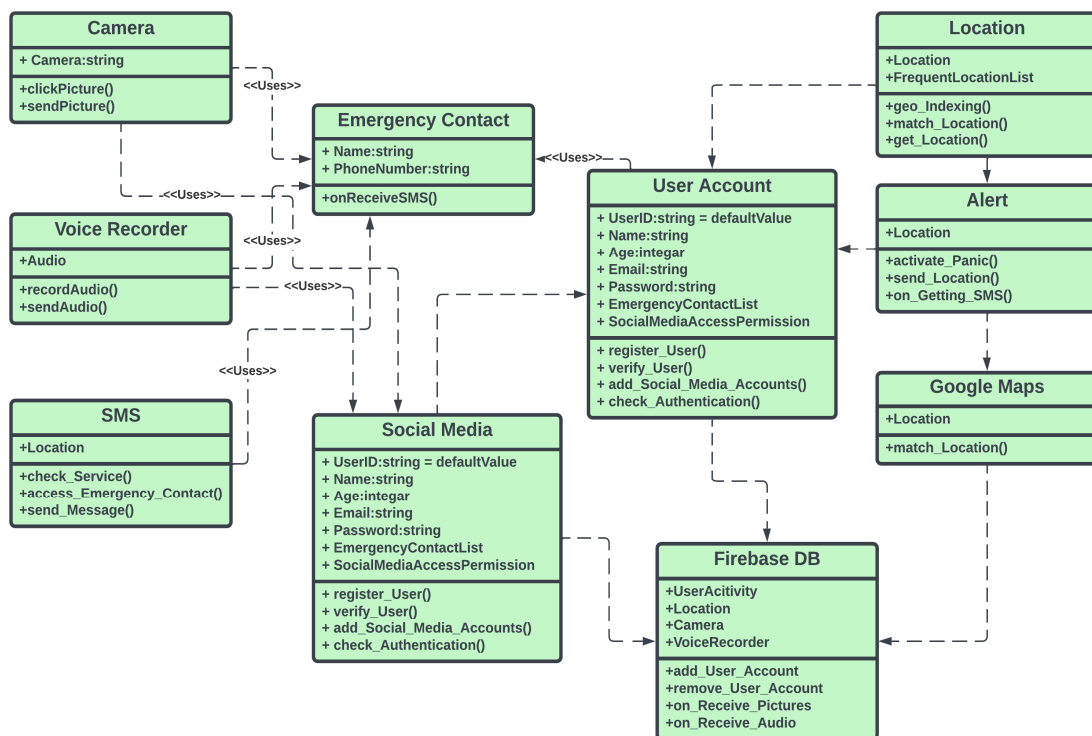


Figure 2. Class diagram.

4. Existing System VS Proposed System

Women Safety Apps Are a Life-Saving Piece of Technology

Women can get hold of at this juncture of time. These apps offer an invisible guard and maybe the simplest and safest tool available against the crooked minds out there in society. However, if we get into the technicalities, sometimes they are not perfect in terms of functionalities that they vouch for. Moreover, these apps don't always offer a hassle-free user

experience as it is supposed to. In the case of safety apps, quality has of utmost importance than any other fact. Proper testing has to be done to make sure that these apps do not have any kind of flaws. Since people rely on these apps for safety, it's trust that has to be valued more than anything else. Our proposed app comprises all the user-friendly features with minimal limitations possible. We have compared a few of the major issues and confinements the existing apps have as per client sees with the uniqueness of our proposed app and the results are as appeared in Table 1.

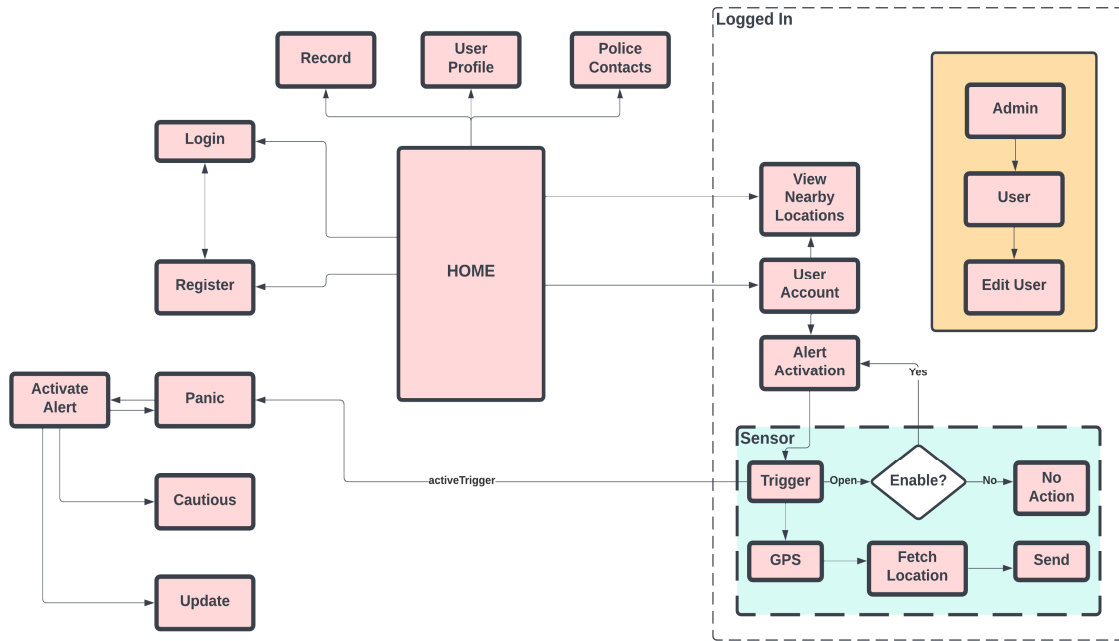


Figure 3. UI Flow Diagram.

Table 1. Comparison between existing and proposed system.

Existing Apps	Limitations of existing Apps	The uniqueness of the Go-Fearless App
Women's Safety App	Advertisement pop-ups, Audio-video recording malfunctions.	No Advertisement pop-ups, Saves recordings in Firebase storage.
Citizen Cop	Inaccurate location, Notification issues, Icon non-visibility, and too many requests for access permission.	Location accuracy, No unnecessary notifications, clearly visible icons, one-time access permission.
Family Locator	Tracking and Login issues, low performance at peak time.	No issues with tracking location and low performance.
Eyewatch SOS for Women	Malfunction in SMS module, Consumption of too much power, Issues with sending OTP.	SMS module simplified, Less power required, No need to send OTP.
My SafetyPin	Usability issues, Social media integration issues.	User-friendly, Built-in social media integration.
Raksha	Message not getting delivered on time.	The message gets delivered right away unless any network issues with the operator.
bSafe	Trouble in account creation, misleading info regarding subscription.	Easy account opening with no hidden info regarding subscription.
Himmat Plus	Touch calibration issues, App crashes in between, Unable to function in the background.	Activates panic alert by shaking the device, no crash in between works both online and offline.
Chilla	UX and download issues.	Autosave option in Firebase storage, so no download issues.
MSMR	Unavailability of content, lock screen information visibility affected, battery consumption is high.	All contents available with proper internet connection and some without it
Rescuer	Login and Performance issues	No issues with login.

5. Implementation

5.1. Android OS and Android Studio

This app has been developed in Android Studio and is based on the Android platform, which is a mobile OS

established by the Open Handset Collaboration, which is facilitated by Google and includes other firms. It's essentially an open-source, Ubuntu level of the workplace for portable devices, with a focus on touch-screen gadgets like smartphones and tablets. The user interface is focused primarily on coordinate control, with on-screen objects

controlled by touch signals that resemble real-world activities including swiping, tapping, and so on, as well as a fully interactive console for content input. Larger developers, open-source, and community access, expanded showcasing, multi-connection, cost savings of ad- advancement, better success proportion, and a rich application framework are just a few of the reasons why Android is an appropriate platform for developing this app.

5.2. Modular Description

The modular description of this app gives point-by-point data about the module and its supported components, which are available in different conduct. This application employs GPS for tracking the area of the individual in inconvenience and the framework can be separated into three modules:

- 1) The primary module is the victim's cell, which is a rooted device that uses a 3G/2G connectivity to track the casualty's whereabouts via GPS, capture photos and voice recordings, and save them in the database.
- 2) The second module is the devices of authorized contacts, such as family members, police, or social media groups, who will get a message from the user's smartphone including the URL of the casualty's address.
- 3) The third module is the social media platform, like Facebook, Messenger, or WhatsApp. There would be a specified group where the location, snaps, and voice recordings will be posted in conjunction with a computerized message like: "Help! I'm in danger" or "Is anyone near me? I'm being harassed". The user can save the message beforehand while registering. This module requires access requests and permissions from apps and user accounts.

5.3. Sensor

Smartphones and other portable gadgets' movement can be monitored by several sensors provided by the android platform such as linear acceleration, significant motion, gravity, rotation vector, etc. Most Android-powered gadgets have an accelerometer and gyroscope sensors which are hardware-based. Depending on the gadget, the accelerometer, magnetometer, or gyroscope can be used to determine data for software-based sensors [20].

For observing device movements like shake, tilt, swing, or rotation, motion sensors are essential. The development is more often than not a reflection of coordinated user input. In this app, the enabling Panic button makes it actionable by shaking the device thrice. A high pitch alert is generated on rotation. For avoiding unnecessary noise and false alarms it can be disabled as per user requirements.

5.4. Firebase

The proposed android application used "Firebase" mobile and web application development platform by Google, trusted by beat apps. It is built on the Google framework and scales consequently, for indeed the biggest apps. It helped develop this app faster and provides functionality like

database management, data analytics, messaging, and crash reports without needing to manage infrastructure so we could focus on the needs of users.



Figure 4. Trigger By Shaking (Enable/Disable).

For this app to store data and information accurately, Firebase authentication is required during development for login and sign-up. Firestore contains all the client information, recordings, and substances. Conditions must be included as required.

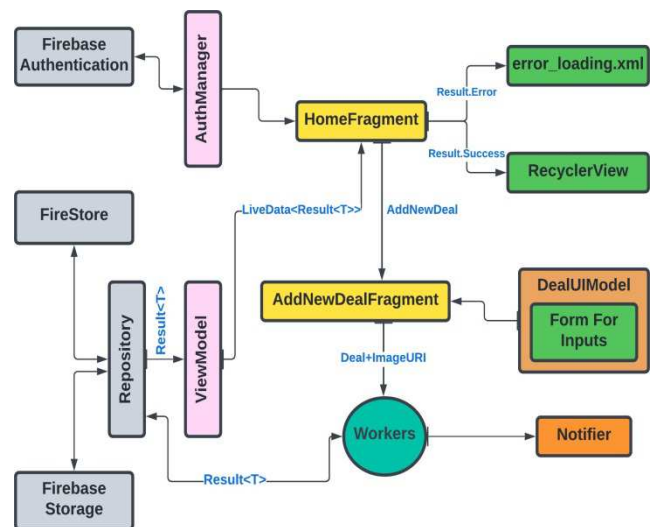


Figure 5. Firebase Authentication.

6. Evaluation Result

Snaps or Screenshots taken in different interims of time provide the testing results of the specified modular depiction from the root device.

6.1. User Interface

The user can only see, interact and connect with the app's user interface, thus making it a crucial element in the whole application development process. We were able to create the graphical user interface for our program using an in-built plugin such as structured layout elements and UI controls. In this application, other UI components such as dialogs, notifications, and menus are also implemented for exceptional communication.

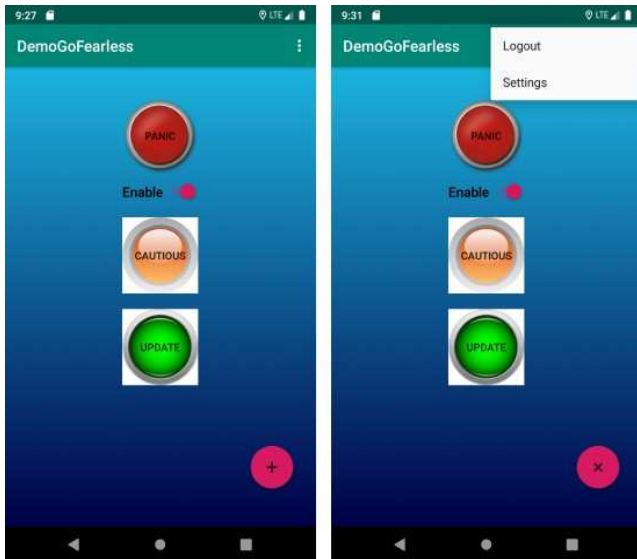


Figure 6. User Interface.

6.2. Login or Sign-up

This is where users can log in or Sign up. Here user can enter his/her Name, Email, Address, Username Password, and Contact number. If a user is already registered he/she can directly log in by entering a username and password.

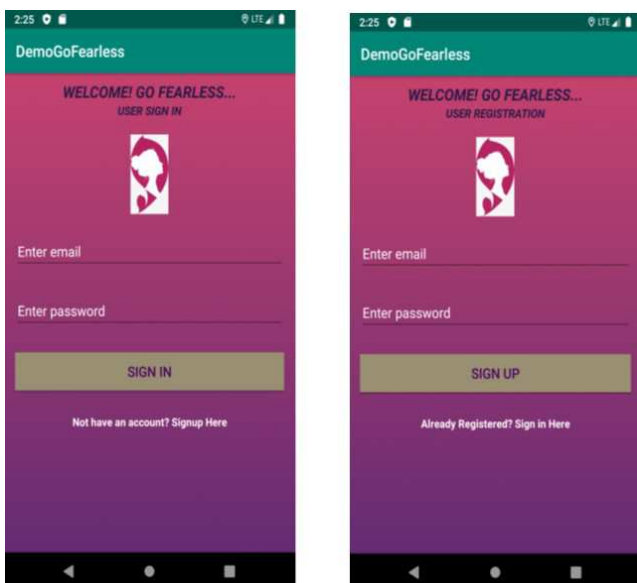


Figure 7. Login or Sign-up.

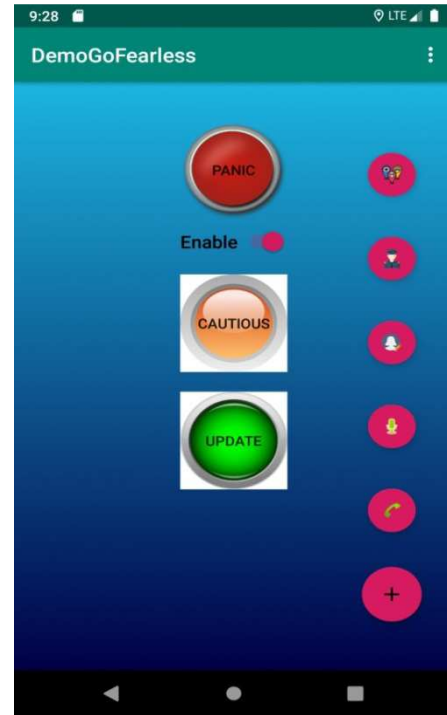


Figure 8. Features.

6.3. Features

There are three major features: PANIC, CAUTIOUS, and UPDATE. Five other features inside the floating action button for assistance: Call national security number, record, user profile, police contact, and nearby locations.

6.3.1. Panic

Once triggered by shaking the device thrice or tapping the button itself, a high pitch panic alert will be generated on repeat and won't stop even if the app is closed.

6.3.2. Cautious

Tapping the cautious button will start to fetch- ing the current location and there are three options to select from. View, copy, and share. All three options will give three different link types to share location: Google Maps, OpenStreet Maps, and GeoURI.

6.3.3. Update

The tapping update button will give options to send a previously generated message to a messenger group to save the hassle of typing a message in emergencies. It can also be used to clarify the reason for sending the location to track. No need to type a message using this feature.

6.3.4. Call National Security

In case of emergency, one can easily tab this button to call 999.

6.3.5. Record

This button starts recording the surrounding happenings and saves those in firebase storage. These recordings can be used as evidence.

6.3.6. User Profile

The user profile contains data about the user's name, address, emergency contact number, blood group, etc. The client can alter this data as she inclines toward. This data is of utilizing in case a rescuer found the victim's phone and helps them appropriately.

6.3.7. Police Contact

Police Contact will show every police contact detail available in Bangladesh. A call can be made directly from the app with just one tap.

6.3.8. Nearby Location

The adjacent area will appear such as banks, police stations, atm booths, hospitals, and taxi stands concurring with the user's current area. This will offer assistance to the client to travel to an obscure area and be informed of her surroundings.

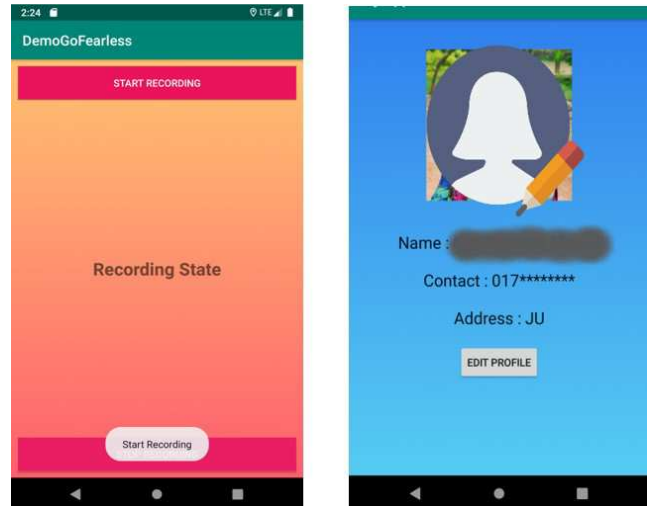
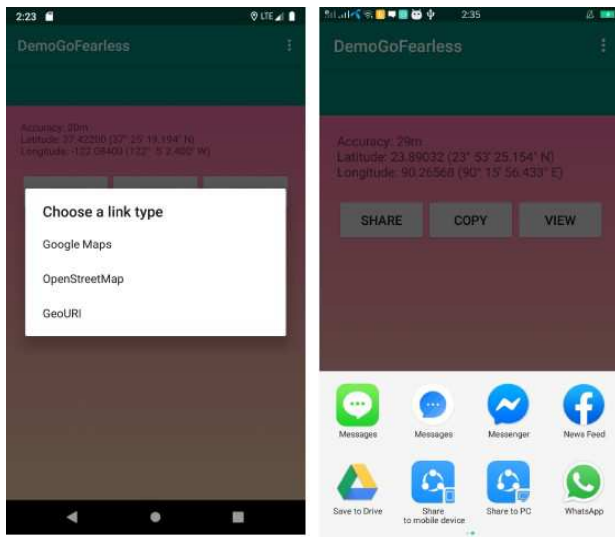


Figure 11. Record and User Profile.



(a) Link Types

(b) Sharing Options

Figure 9. Fetching Locations.

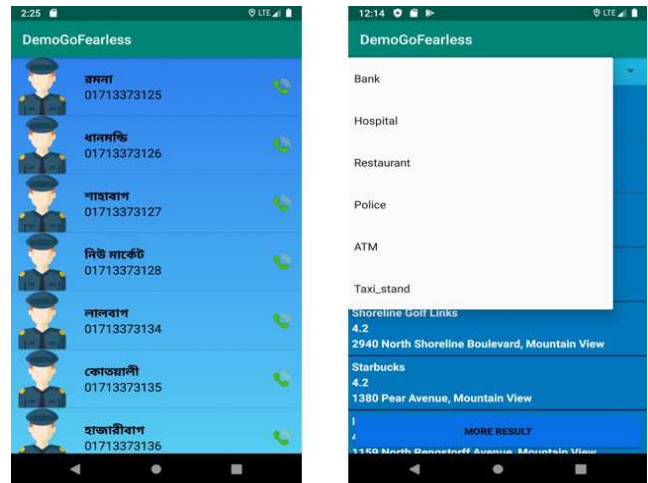
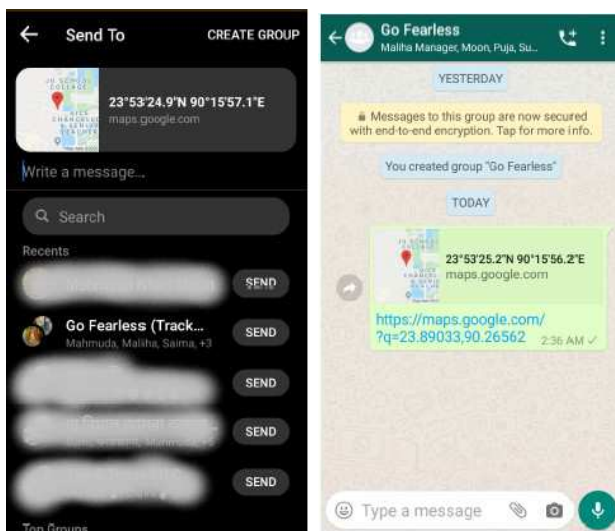


Figure 12. Police and Nearby Locations.



(a) Messenger Group

(b) WhatsApp Group

Figure 10. Sending Locations.

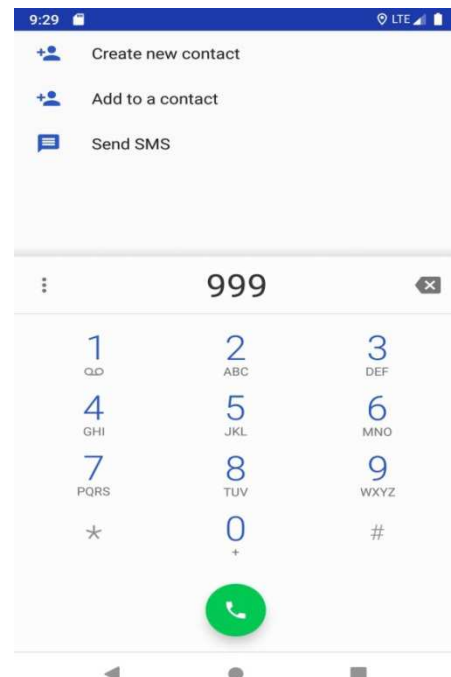


Figure 13. One tap Call to National Security.

6.4. Testing Analysis

During testing, The security measures safeguarding the application, its data, and the infrastructure that it supports will be tested and validated using the system and user details. This phase includes, but is not limited to, the following attack scenarios: SQL injection, session spoofing, buffer overflows, application or system configuration problems, DNA hacks, faking, sharing access, and exploitation of system trust relationships are all possible. The following major areas are addressed during a web application test:

- 1) Authentication and access control;
- 2) Use of cryptography;
- 3) Session handling;
- 4) Security of network communications;
- 5) Server configuration and related controls;
- 6) Application Data Storage;
- 7) Injection vulnerabilities;
- 8) Input handling;
- 9) Side-channel attacks and information leakage;
- 10) Network traffic analysis.

Since user inclusion and feedback is one of the foremost valuable components for app development and given the low mindfulness appeared by our sample of women, it may be valuable to create modern studies and consideration to get it the requirements and desires of women concerning these safety apps. [21], as demonstrated and researched for other safety apps [22-24].

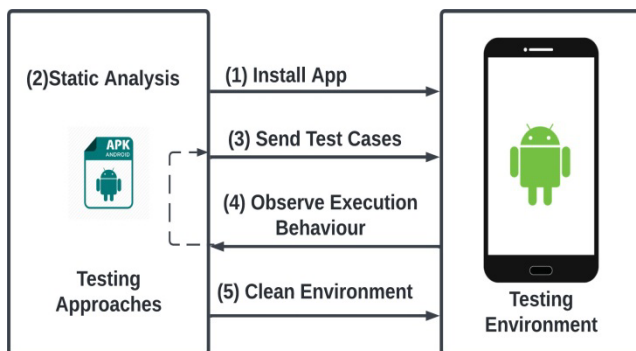


Figure 14. Test Analysis Workflow.

7. Conclusion and Future Scope

7.1. Conclusion

Tragically, the security of women is in question, and it is not a concern. Increasing patterns of sexual assaults, abuses, harassment, and rapes are continuously occurring in today's era, as evidenced by numerous aspects consistently coming over against women. Violence against women may be a noteworthy public well-being issue, and a fundamental infringement of their human rights. So we are attempting to contribute small exertion towards ladies which can guarantee the security and regard for them so that they can have the proper opportunity to develop side by side with men and break the bias.

In this paper, We have introduced GoFearless, an Android application addressing women's safety. This app facilitates

the real-time tracking of the victim's location to social media groups and emergency contacts. Multiple sharing alternatives in three different link types, Google Maps, Openstreet maps, and GeoURI, are one of the unique features of this app. It generates a high-pitched panic signal which can be activated simply by shaking the device. It is also possible to activate it by tapping manually. The settings provide the user with options such as, even if the app is closed, the panic alert will continue repeating till the user turns it off when feels safe. The advantage of this app is that we can pinpoint the exact location of the root device even when its location fluctuates rapidly. This app is essential for women of various ethnicities in emergency and daily assistance. It includes a one-tap call to the national security number and nearby locations such as hospitals, police stations, and bus stops. The surrounding events can be recorded and saved to Firebase storage for future references, such as evidence by hitting the record button.

It may well be established that our app gives women in our society hope for a safe atmosphere and allows them to work bravely. Anyone considering committing a crime against women will think twice if national security gives this public safety app significant attention and takes appropriate action.

7.2. Future Scope

For future development of this app, It can be linked to a police department's database that contains all of the regional cops' phone numbers. Further, it can be developed with the help of artificial intelligence, emotion recognition integration, and machine learning theory not only for Android but also for IOS and Windows mobile platforms. Thus, if this app can sense extreme emotions faced while being attacked or harassed, without having to press any buttons or shake the device, it will be a revolutionary change in the safety app family. Notebooks, game consoles, digital cameras, and other electronic devices also use variants of Android [25]. Further research on our project might result in implementing the process on small portable and wearable devices such as earrings, smartwatches, bracelets, pendants, etc. When this framework is activated, the Tracker will obtain GPS coordinates, encoded into a substantial Google maps URL and delivered through SMS to emergency contacts.

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