EMERGENCY RESPONSE SYSTEM

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled **"Emergency Response System**", submitted by Md Azharul Amin Mulla and Korshed Ahmed to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering (BSc) and approved as to its style and contents. The presentation has been held on 27 January, 2021.

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We hereby declare that this project has been done by us under the supervision of **Most. Hasna Hena, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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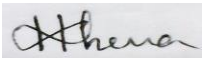

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ABSTRACT

Nowadays android application development has many opportunities and also a big marketplace. The market of android apps is increasing day by day. There are many types of android application, they are used for different curriculums or features. In modern age android mobile phones have become a part and partial of everyone's life. This is clear that the heart of mobile phones are its application.

We created an android app that is named “EMERGENCY RESPONSE SYSTEM”. The main concept of this project is to provide help service & emergency support to people, who are in critical situations or at risk. We know that Communication during emergency time is very difficult for both the rescue team and the victim. Emergency help never comes with prior intimation. This app is able to provide help in case of emergencies in society. The emergencies include Fire, Medical Emergencies, accident and External Emergencies (Earthquake, Floods, Strom).The person who is in a critical condition can use the app and he will be able to send his location to his trusted contacts or police by using this application. During the emergency situation the camera of the phone will enable to take photo/video automatically. The most interesting thing about the application is that it can be started by shaking the phone. This feature takes less time to start and more efficient than sending the help request manually.

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CHAPTER 1

Introduction

1.1 Introduction

In this development project, we used Android Studio IDE to create an android application named “Emergency Helpline App”. We used android studio to develop this app, it has all the features and it is the most reliable android app developing tool out there. Android has become the world’s most popular operating system for smartphones and tablets in recent years. We used Java programming language throughout the development. The main purpose of this application is to get help faster to people in need. Considering our real life demand and situation, this application will be a great technological support for users. There are lots of emergency help applications available but they are less user friendly. We tried to create a different and more effective application which has lots of features. In our application we tried to cover health issues, criminal fact, ensuring government provided services, and developing our self-defense skills

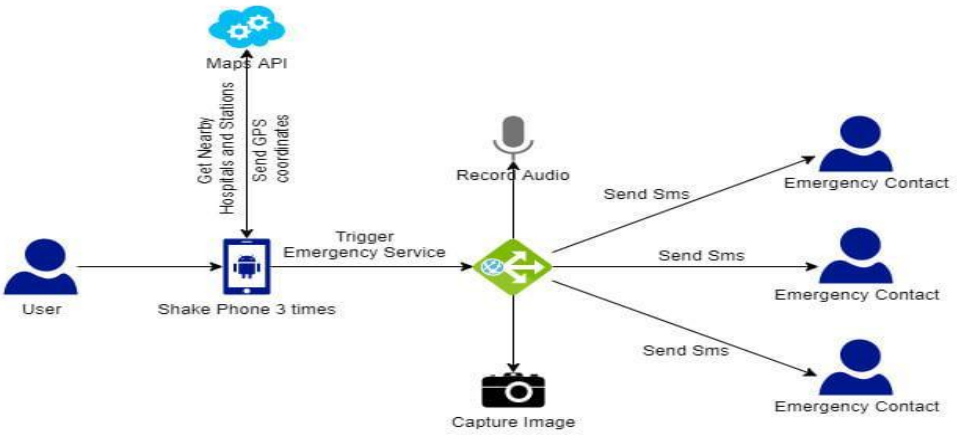

Figure 1.1: System Architecture

1.2 Motivation

To ensure public safety in various incidents by providing faster assistance. To reduce time cost in getting help. Protect people from danger situations and help them to find facilities from government services. Following the present situation of Bangladeshi women safety we are trying to make them safe from any kind of threat. The changing world has inspired us most.

1.3 Objective

The general objective is to provide immediate intervention and assistance to people in crisis. Finding police and professional help in cases related to crime, domestic violence, and fire incident etc. App will take a specific action based on number of shake of device. For example, shake and send email automatically in the saved emergency contact number. The email contains a default message like Hey i am in danger, my location is (victim last location). In this email two photos will be shown which are captured by the victim camera. In those photos a photo will be taken by front camera and other is captured by back camera. A short length audio record also sent from help seeker device. By this email trusted people can easily find him and also understand the proper situation. Unfortunately, if something ugly happens with the victim, the email will be a strong evidence against the criminal.

1.4 Expected Outcome

An app that will start working when the user shakes the device. App will take action based on the number of shakes. In an emergency, trusted contacts of the user will get a SMS/notification about the victim's situation. During the emergency, the camera will take pictures/video automatically and send them to get help. If anyone faced health issue the person can find nearest hospital in 5km radius. Same as if the user needs to find the nearest police station he can find also by using the application. The application also teaches the user some self-defense movement. Those self-defense movements are really helpful for women. The users of this application can find some government service. By shaking the phone it sends a message on the phone inbox of a trusted person, with the location coordination. When the trusted person clicks on the coordination it will show the exact

location of the sender. As expected, we hope this application is able to provide a reliable helping service in critical condition.

1.5 Report Layout

Chapter 1: Introduction

Here we discussed our project idea and the motivation of our project. The actual work and benefits of the project is shown here. How the application will work and the outcomes of the project is written on the introduction part. In this chapter we discuss the background of the project and requirement specification. Design specification Implementation and testing of the project is also covered in this chapter.

Chapter 2: Background

We discussed the background circumstances of our proposed system here. As background work we take ideas from research papers and similar projects which are related to ensuring security by using technology. We consider some real and probable facts which might be happening with a person. Our project does not provide only one kind of situation help, it has to provide multiple helping features. So keeping all those factors in mind, we tried to visualize all kinds of situations and tried to solve all the problems by a single system. It's hard to solve many problems by a single system and implementation is also difficult. Thinking of some people and their research helps us a lot.

Chapter 3: Requirement Specification

All the requirements throughout the project is discussed in this section .Like Business process modelling, requirement collection and analysis, use case modelling and description and the design requirement.

Chapter 4: Design Specification

This chapter contains the front end design, back end design, Interaction design and user experience followed by implementation requirements. In this chapter all kinds of design which is related to our emergency helpline application will be discussed.

Chapter 5: Implementation and Testing

Here we discussed all about implementation and testing of our project. How the database is implemented, implementation of the front end design, testing implementation, test results and the report are included in this chapter. The usability and reliability of this project is also included in this chapter.

Chapter 6: Conclusion

In this chapter, we concluded our project report with some short discussion on the whole project. This chapter contains overall matter which is implemented in this project. This chapter can give an overview of the whole report.

CHAPTER 2

Background

2.1 Introduction

This chapter is about the theoretical explanation of the terminologies used in this project. Here we discussed all the pre development activities and planning. The chapter also focuses on research of related work that has been done previously. We also added a section discussing the challenges and problems we faced throughout the development.

2.2 Related Works

Safety & security has been the number one concern for Bangladesh in recent years, especially for the women's. That's why many individuals and organizations came forward with their works to help the people in need. A rescue system was developed using a wireless sensor network [1]. A smartphone app was developed for burn injury emergency care [2]. Even the government took initiative in this matter. Such as Bangladesh police has an official app on play store named "Bangladesh Police Helpline"[3] and another call service which you can access by dialing 999[4]. There are several apps available on play store who provide similar services. Such as SoS Direct-Emergency Helpline, ICE-In Case of Emergency, SOS Alert, Emergency Call etc.

2.3 Comparative Studies

As we already discussed about the previous works that are already available, almost all of them have some limitations and problems. Firstly many of them are not properly suitable for Bangladesh. Because most of the apps don't have Bangladeshi helpline center and Police information added to their app. Secondly, the seeking help process of those apps are time consuming and complex. In an emergency situation, every second matters. We took the time factor seriously and tried our app to operate faster. Such as it will start working

right when you shake the phone. There are other problems too. Suppose there has been an incident but the support is far from the scene, in this case it will take time to get support. To solve this problem, we added a feature in which other users who are close to the incident scene will get a notification letting them know about the incident. So anyone willing to help can reach the victim and take primary action before the official help reaches.

2.4 Scope of the Problem

Our project is an android based project. In android there are different types of version and API. For different types of API and version this project should not perform the same. We tried to make it able to perform on all platform. We used location tracing widely in this project and this system may differ in various devices.

2.5 Challenges

Emergency Helping service is used when any one faces a critical situation. If we go for the overall challenges there are many issues that stand against our way .At first we can consider the availability of the internet .our project is internet based .without the internet connection any user will not be able to use the system and the appliances. This is unpredictable when anyone will fall in a dangerous situation. There can be many things happen, and the main challenge is to build an application keeping all the possible situations in mind. The application has the ability to consume less time and perform required activity very efficiently. Every second is important because in a dangerous situation anything can happen with the victim.

The development of the project is also challenging because android app development requires a deep knowledge of programming language and also requires the extensible markup language (XML). They also need knowledge on the web and databases. So we can say that for developing an android application the developer has to be knowledgeable in one different sector on computer technology. Rapid change of technology is also a challenge for developers.

There are some more challenges they are:

- Software Fragmentation
- Device Fragmentation.
- Absence of Standard User Interface for Android.
- Emerging Security Issues
- Increasing App Visibility.
- Patent and Copyright Issues.

CHAPTER 3

Requirement Specification

3.1 Business Process Modeling

Business process modeling is a way of representation of business processes. In this case, it will be the activity, connection and actions of representing the process of our proposed system so that our current method may be analyzed and improved and to make it easier to understand. It is usually done through different graphing methods such as flow chart, unified modeling language etc. We used BPMN (Business Process Model and Notation) diagram to show the business process model.

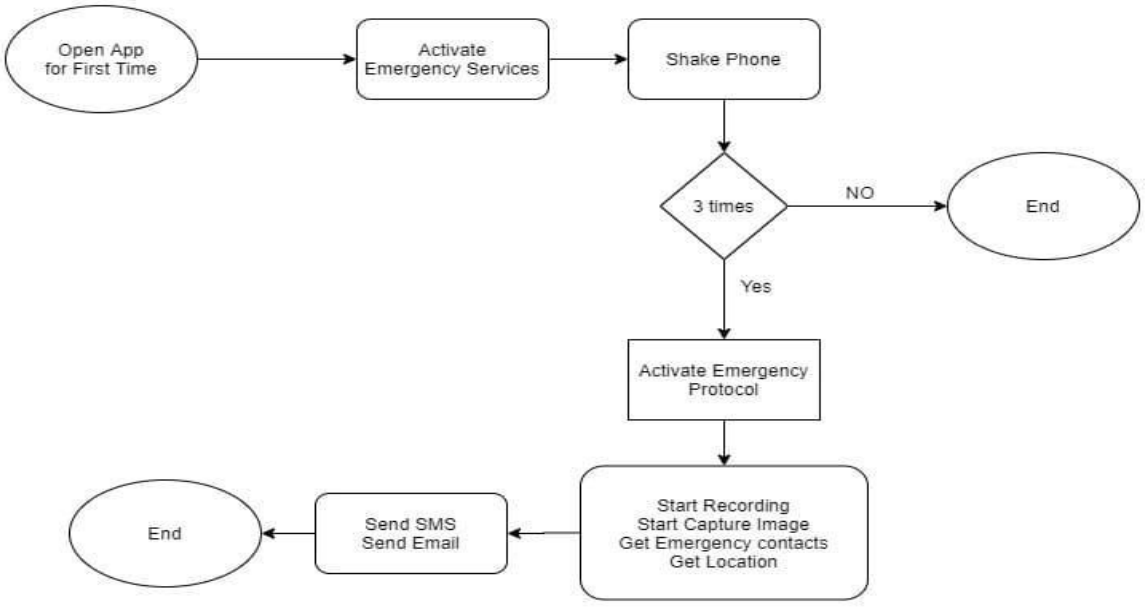

Figure 3.1: BPMN Diagram

3.2 Requirement Collection and Analysis

There were some things required during the development process of our application.
First of all we needed an IDE (Integrated Development Environment) to develop our app. We chose android studio as our core development environment. As we wanted to use the Java programming language, android studio was most suited and friendly for us. There were other benefits too for choosing android studio. It has a rich community of developers and all the resources are available on the internet (Google, GitHub, YouTube etc.). So it is easier to get help in case we face any problem.

We needed the information of the police station and helpline center (location, phone number etc.) to add to our system. Because when users ask for help, the police station should be informed through a call or SMS. Users will interact using the android app in case of emergency. Users have to allow the app the permission of location, audio, camera etc. . We also needed the information of hospitals to help the victim find one in case of need or injury. As users will be from different places, a lot of hospitals were added in order to ensure better service.

3.3 Use Case Modeling and Description

In this section, we tried to explain the whole app and the working system through a flow chart. To start, our mobile application needs to be launched. After launching the app, it will ask the user to sign up with valid information or login. The app requires several permissions from the user to operate properly. Such as location permission, camera permission, audio permission, call/sms permission etc. Application also needs a stable internet connection. If the device is not connected to the internet it will proceed to the user interface but won't function properly. After the connection is established, the system will load the UI with several tabs and buttons. Every service and functionality can be accessed and used with the

help of UI. The help icon needs to be pressed in order to run the app. If any input command is not given it will stay as it is.

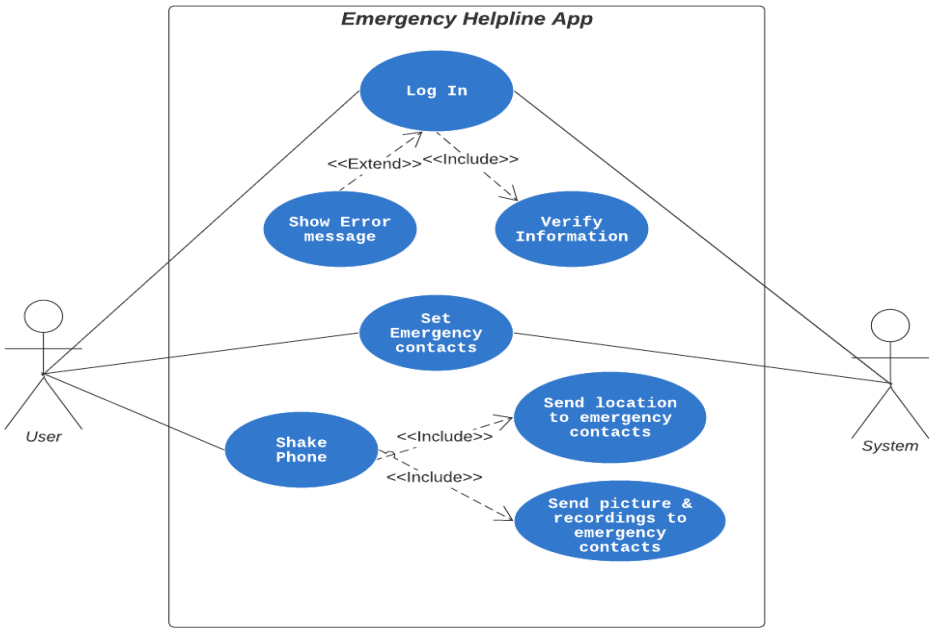

Figure 3.3.1: UML Diagram

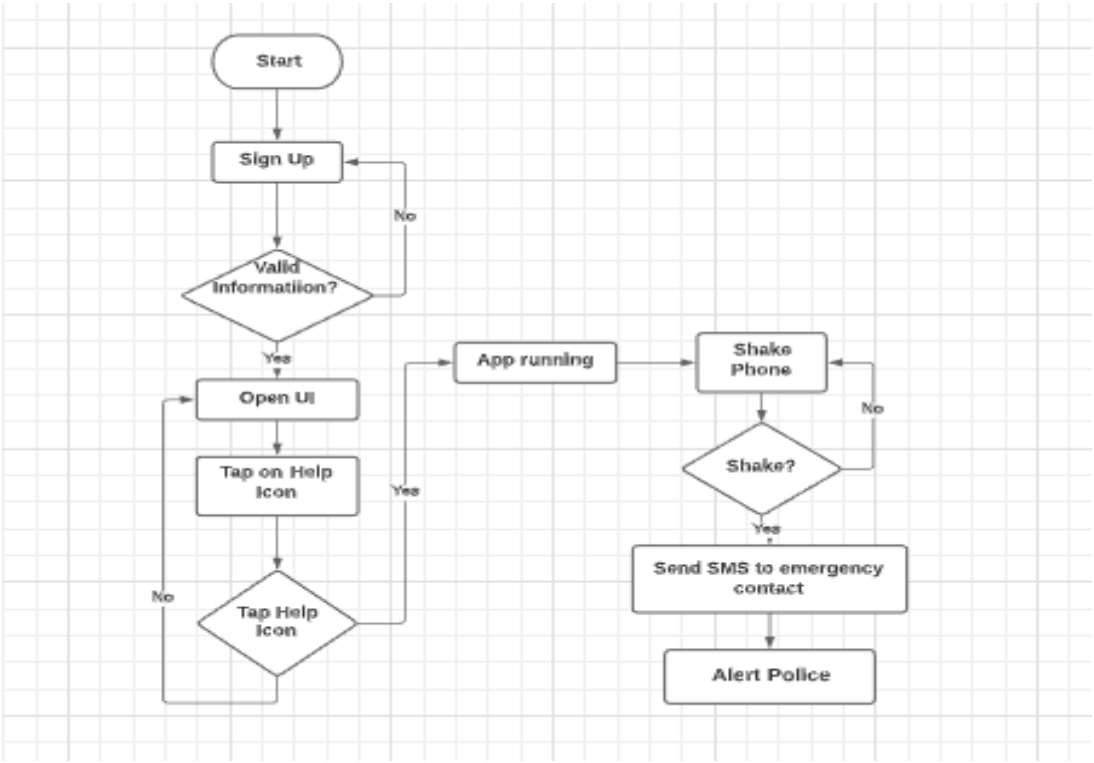

Figure 3.3.2: Flow Chart of the System

3.4 Logical Data Model

Data model is a model which shows how data is connected to each other and how they proceed and which way they are stored in the system. If we consider our “Emergency Help Line” application there is a login page and there the user has to put some data like name, email, password, NID card number, phone number, and gender. On the emergency contacts users have to put name, email, phone number, and address. As for the location there also need latitude, longitude, and last updated data required. At the end all those data are stored in firebase, which is a database.

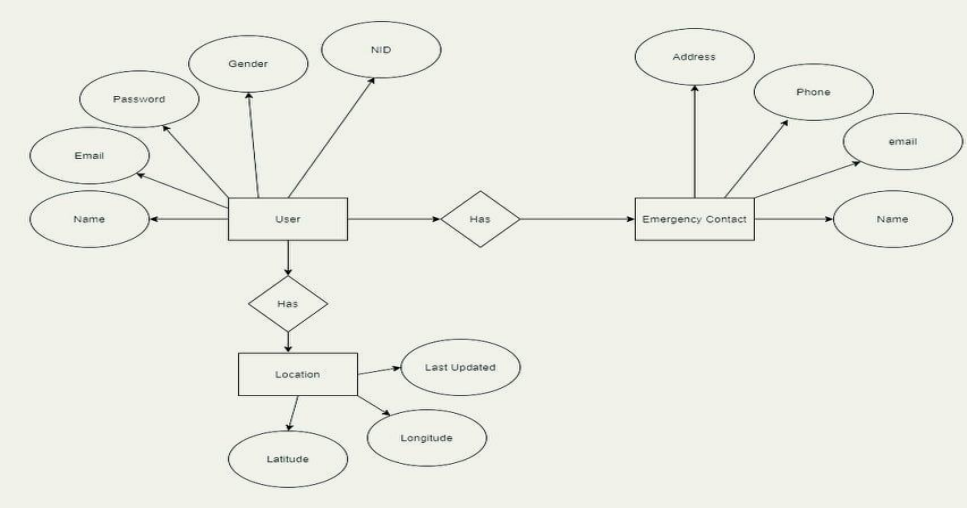

Figure 3.4: Diagram of Logical Data Model

3.5 Design Requirements

As it is an android app development project,design means the designing of the application and an interactive User Interface for our project. As we mentioned already, we used android studio 4.0.1 to develop the whole application. So the design requirements were pretty simple. As android studio is a heavy software, we chose a computer with enough specification to run android studio smoothly. We also used another designing software named “Figma " to design the UI (User Interface), but this was only for the visual purpose

as android studio comes with drag and drop UI designing features.For designing purpose need lite knowledge on graphics design.

CHAPTER 4

Design Specification

4.1 Front-end Design

We have used XML to build our UI/UX or frontend design. XML, in full extensible markup language, a document formatting language used for some World Wide Web pages. XML began to be developed in the 1990s because HTML (hypertext markup language), the basic format for Web pages, does not allow the definition of new text elements; that is, it is not extensible. Android natively supports XML for Frontend building. Android Studio provides several different XML components such as Linear Layout, Relative Layout, Button, Text View, Edit Text, Constraint Layout, Radio Button, Radio Group, Spinner, View Pager, Frame Layout etc. We have used mostly linear layout and Relative Layout in our app. We have also used images which are in SVG format and some are in PNG format.

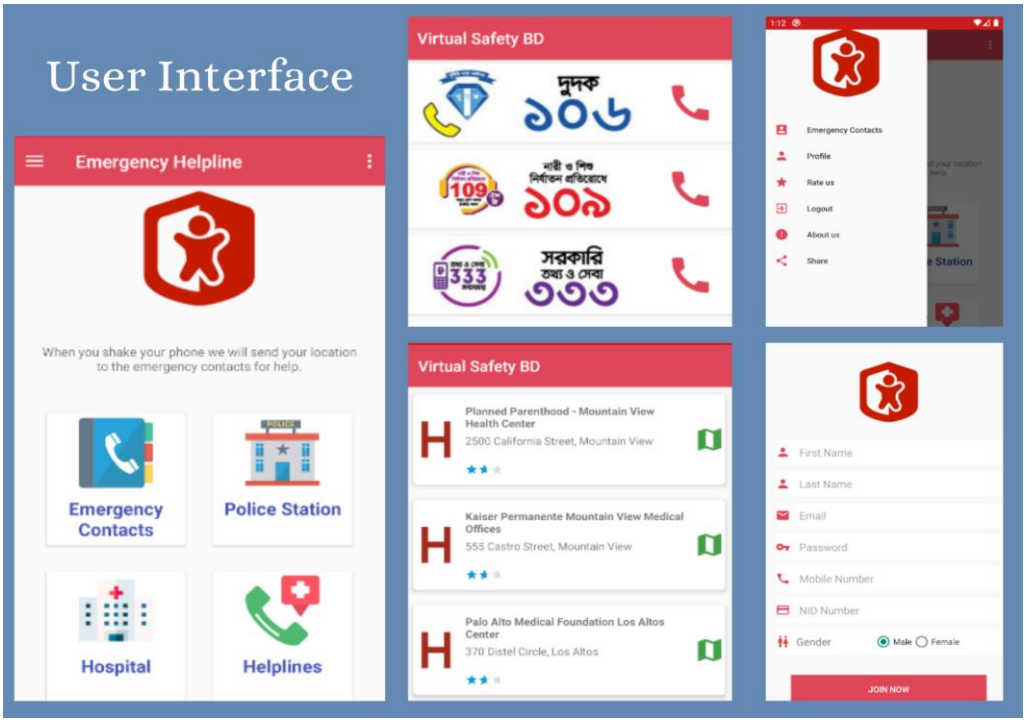

Figure 4.1.1: Front-End Design

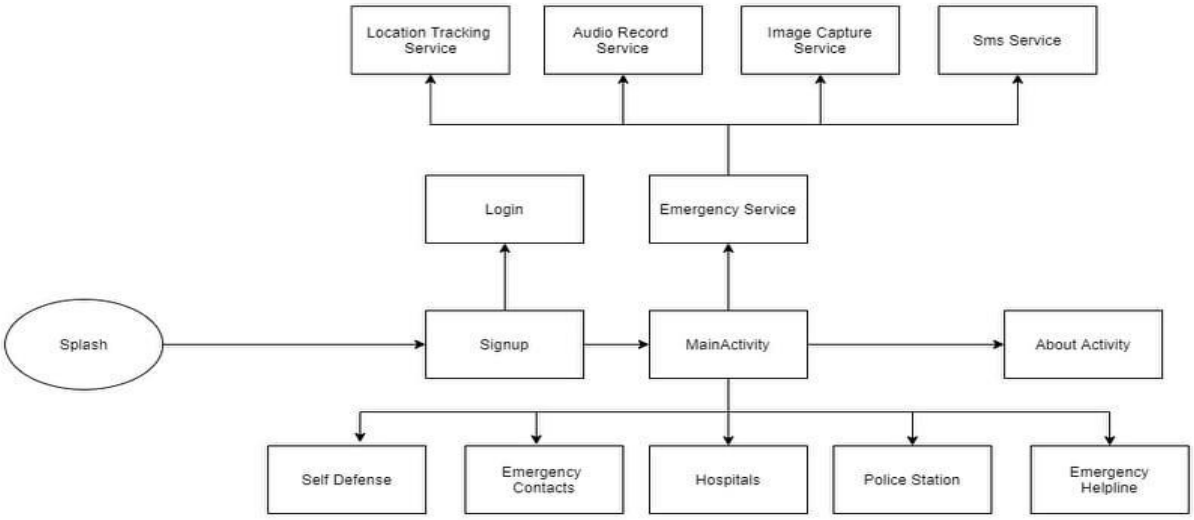

Figure 4.1.2: Front-End Design Process

4.2 Back-end Design

For the server side we have used Firebase Augh for Authentication, Firebase Real-time Database for Storing data. Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, and more. Firebase Authentication integrates tightly with other Firebase services, and it leverages industry standards like OAuth 2.0 and Open ID Connect, so it can be easily integrated with your custom backend. Authenticate users with their email addresses and passwords. The Firebase Authentication SDK provides methods to create and manage users that use their email addresses and passwords to sign in. Firebase Authentication also handles sending password reset emails. The Firebase Real-time Database is a cloud-hosted database. Data is stored as JSON and synchronized in real time to every connected client. When you build cross-platform apps with our iOS, Android, and

JavaScript SDKs, all of your clients share one Real-time Database instance and automatically receive updates with the newest data. Instead of typical HTTP requests, the Firebase Real-time Database uses data synchronization—every time data changes, any connected device receives that update within milliseconds. Provide collaborative and immersive experiences without thinking about networking code. Firebase apps remain responsive even when offline because the Firebase Real-time Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state.

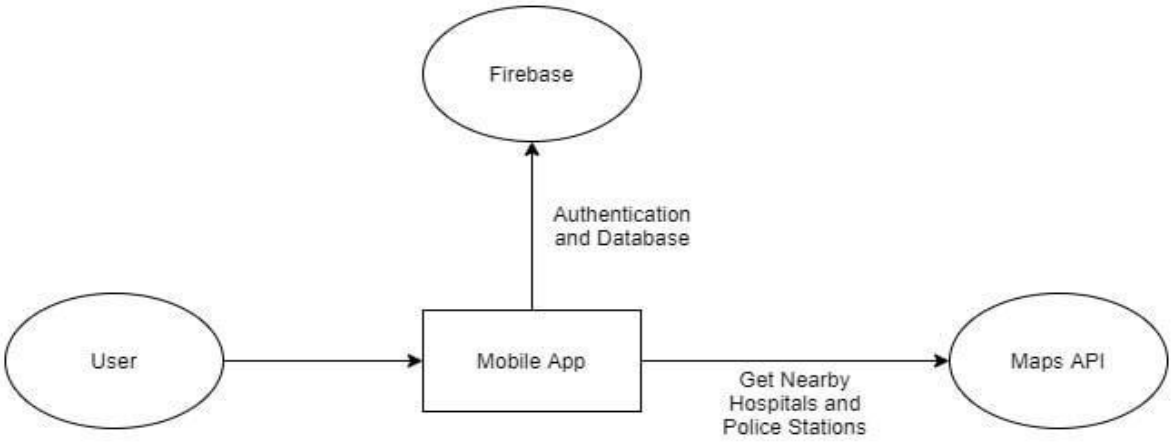

Figure 4.2: Back-end Design Process

4.3 Interaction Design and UX

We focused on giving the users a better experience by providing minimal turnaround time. We made the interaction between the front-end buttons and back-end processes pretty smooth. For instance, when the help icon is pressed the app immediately gets ready for shake and shows a notification saying the app is running and ready for shake. All these

tasks are done within a blink of an eye. When few shakes are detected, an SMS is sent to all of the emergency contacts with the user's location.

4.4 Implementation Requirements

Implementation requirements are basically two types, functional and non-functional requirements. For implementation android studio is required. Here we used some libraries of gradle which are required to implement our application properly. Those gradle are used to run all activities of our project and they maintain a correlation between activities. Minimum android version marshmallow is required. For storing data firebase is required.

CHAPTER 5
Implementation and Testing

5.1 Implementation of Database

In this project we used Google's firebase [5] as our database. We don't use any isolated database for storing data as Google Firebase offered us the server and also the database. There are few more steps to connect the database, firebase gives the authenticating key of the database which varies depending on the Firebase App and it gives access to use the database. We must provide the database URL and it must be the corresponding Firebase App. For the android App we add the json file which we get from the Firebase App. When all the data which is already discussed is imputed by the user those are stored in the database subsequently.

5.2 Implementation of Front-end Design

The first rule of Front-End Design is to make it appealing, easier and simple. We tried our best to make the UI simple but user friendly as possible. For instance, we added the get help icon at the top of UI to catch the user's eye. We also added instructions below the button to help users understand the functionality of the button.

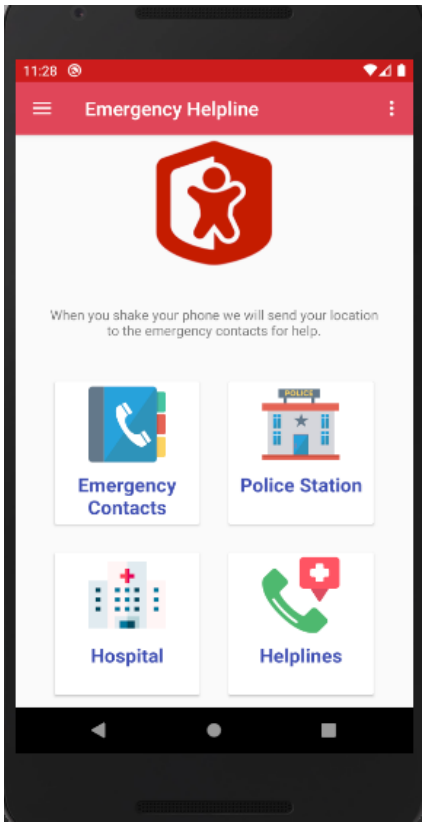

Figure 5.2: Application User Interface

5.3 Implementation of Interactions

We have 3 layers of components in our application. Layer one is the data layer or model layer. This layer is representing the presentation of the database schema. Each model defines the exact type and copy of the database schema. As firebase is NoSQL[6] database each model represents the diagram or structure of child in the firebase.

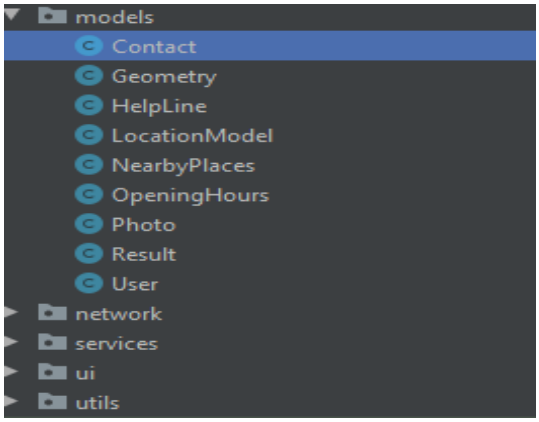

Figure 5.3.1: Data Layer

The second layer is access layer. This layer accesses the data from the database and also stores the data into database.

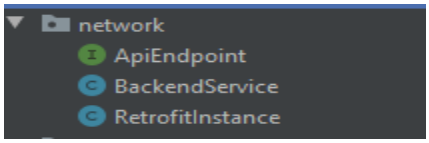

Figure 5.3.2: Access Layer

Third layer is the UI layer. After accessing the data from second layer. This layer presents the data as visual output to user. The user interface layer represents the front end of the Mobile application, and contains the actual GUI elements that users view and click.

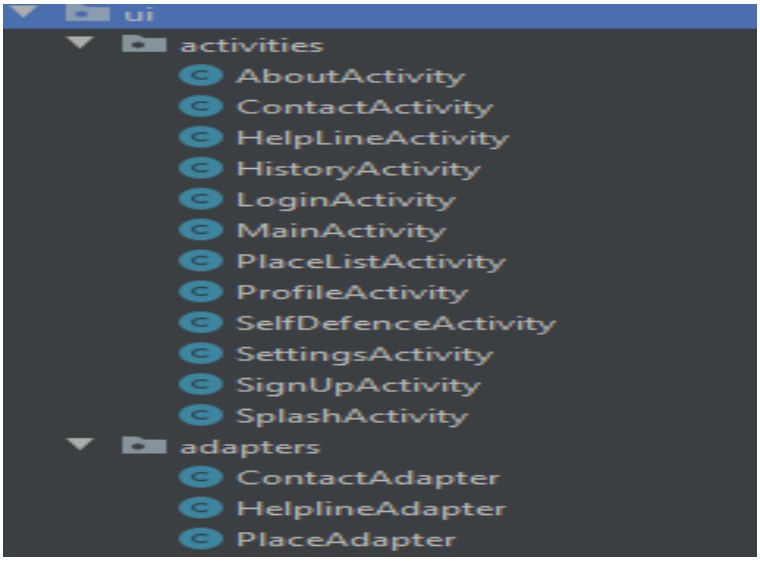

Figure 5.3.3: UI Layer

5.4 Testing Implementation

Implementation testing generally refers to the process of testing implementations of technology specifications. This process serves the dual purpose of verifying that the specification is implementable in practice, and that implementations conform to the specification. This process helps to improve the quality and interoperability of implementations.

Following types of testing are performed in for our Android Application:

1) Functional Testing:

Testing is normally achieved by user interface initiated test flows. Not just the flow of a use case is tested, but the various business rules are also tested. Testing is done by certifying the requirements. i.e. whether the application is working based on the requirements.

In this testing we have tested and confirmed:

- Verify whether the nearby hospitals are shown.
- Verify whether the nearby police stations are shown.
- Verify App can identify user's current location.
- Verify App can detect user's Shake.
- Verify App can take photos and record voices.
- Verify App can send SMS and EMAILS.

2) Android UI Testing:

This is a user-centric testing of the application. In this test phase, items such as visibility of text in various screens of the app, interactive messages, alignment of data, the look and feel of the app for different screens, size of fields etc. are tested under this.

In this testing we have tested and confirmed:

- Verify whether the cards are shown properly aligned with the mobile screen size.

- Verify whether the images of the helplines are shown as expected.
- Verify whether the card details, phone number, address etc. are shown properly aligned.
- Verify whether the scrolling of the list is glitch free and the cards are not shown
- Misaligned when a long list of cards is scrolled.

5.5 Test Results and Reports

Test and Result Table:

No	Name	Description	Result
1.	Signup	This test is done to verify user signup	success
2.	Login	Login test tested by different accounts.	success
3.	Add Emergency Contact	Emergency Contacts can be added properly.	success
4.	Update Emergency Contact	This test is done to verify Update Emergency Contact.	success
5.	Delete Emergency Contact	This test is done to verify Delete Emergency Contact	success
6.	Detect User location	This test is done to verify Detect User location	success
7.	Show nearby Police stations	This test is done to verify Show nearby Police stations	success

8.	Show Nearby Hospitals	This test is done to verify Show Nearby Hospitals	success
9.	Activate service	This test is done to verify Activate service	success
10.	Detect User Shake	This test is done to verify Detect User Shake	success
11.	Take Photos	This test is done to verify Take Photos	success
12.	Record Audio	This test is done to verify Record Audio	success
13.	Send SMS	This test is done to verify Send SMS	success
14.	Send Email	This test is done to verify Send Email	success
15.	Dial Helpline Numbers	Helpline Numbers working efficiently.	success

Table: 5.5 Test and Result Table

CHAPTER 6
Conclusion and Future Scope

6.1 Discussion and Conclusion

So finally we are going to conclude our proposal with some short discussion. Our project proposal was about an emergency helpline application which provides support and help with a shorter period of time. This app will provide help for health issues and criminal activity etc. The whole system can be operated through a smartphone with internet connection. We already pointed to the major factors about our Emergency Helpline application. Such as seeking help by just shaking your phone, informing user's emergency contacts about the situation, sending images and audio of the scene etc. This app will minimize the time cost and will increase the chance of getting help sooner.

Although this application promises many things, it has some lackings too. A good internet connection is required to run the app smoothly. The app needs to be running in the background before someone shakes. And before you shake the phone, you have to put it out of pockets or bags in some cases.

We think that this is an unique effective application which will boost the chance of getting help and reduce time in case of emergency.

6.2 Scope for Further Developments

The emergency helpline application is developed for safety purposes. It might require certain upgrades and changes in the upcoming future. This app has lots of scope to develop.

We will discuss some of the possible features or upgrades that can be done in this application.

A shake meter can be added to measure the level of emergency. For example, more shaking will indicate a higher level of emergency. A feature that will be taking action based on the number of shakes can be implemented (example: 3 shakes for medical support, 5 for police support).

In future there can be a feature added by using that the parents can monitor their children's activity. They can track where their children go and what kind of situation they are facing. There can be added auto calling in the helpline according to the required situation. Such as calling the nearest hospital in case of injury, police station if theft or robbery happens etc. For android security issues at this time, we are unable to open the app without unlocking our phone. In future those issues might be solved, then the application will open without unlocking the phone.

A security services providing company based on this application can be created. This company can hire people who are always ready to support the user in any kind of situation. Using advanced technology like Artificial intelligence can enhance performance of the application more efficiently. By using AI this app can measure data from certain situations such as sound, movement etc and take actions considering these data. In the end we can say that this application has lots of scope for future developers.

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