UNIVERSITY OF MASSACHUSETTS DARTMOUTH

DEPARTMENT OF COMPUTER & INFORMATION SCIENCE

"Blood Donation" android application

CIS 600: MASTER'S PROJECT

Final Project Report

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Abstract

This is Blood Donation Android application. This application helps to find right person in need of blood. We can even find hospitals and blood donation camps near user. Patients can view available donors. Patients can also see location and contact information of donors and they can directly contact donors through the application. This application is also keeping track of when and how many times donor have donated blood. After three months of last donation it will give notification to the app user as a reminder for donation. In this application Patients can search available donors of different blood types. And can see location of donors on the map.

Chapter 1: Introduction

1.1 Motivation

Blood donation is one significant contributions to society. Human body regenerate blood within few days. So, it's not harm to donate blood to person in need. Donating blood is also good for health. In society there are lots of disease in which patients needs to do blood Transfusion regularly. There is a constant need for regular blood supply because blood can be stored for only a limited time before use. Blood also needs high maintenance for storage. Everyday lots of patients die because they could not find donor. One donor can save many lives if donors blood is separated into its components like red cells, platelets and plasma. Which can be used individually for patients with specific conditions.

Blood transfusion is needed for many reasons like, women with complications of pregnancy, such as ectopic pregnancies and hemorrhage before, during or after childbirth; Children with severe anaemia often resulting from malaria or malnutrition; People with severe trauma following man-made and natural disasters; Many complex medical and surgical procedures and cancer patients needs Blood transfusion.It is also needed for regular transfusions for people with conditions such as thalassemia and sickle cell disease and is used to make products such as clotting factors for people with hemophilia.[1]

Regular blood donations by a sufficient number of healthy people are needed to ensure that safe blood will be available whenever and wherever it is needed.

Blood is the most precious gift that anyone can give to another person — the gift of life. A decision to donate your blood can save many life.[1]

First blood deposit was recorded in 1917. Army doctor collects and stores type O blood, with citrate-glucose solution, in advance of the Battle of Cambria in World War I. Than used for severely injured soldiers In 1937 Dr. Bernard Fantus at Chicago's Cook Co. Hospital coins the term "blood bank." . [2]. Nowadays there are mostly blood banks available in every hospital. American Red Cross is one of the most famous blood bank in USA. People also donate blood for money.

I got motivated because of this reasons. The main purpose of blood donation application is to make it easy to connect people who are in need of blood and people who wants to donate blood in easiest way with the help of smart phone in few touches. This is location based application, with help of this application donors location can be detected and also we can fine nearest matched donor for paiqents.

1.2 Introduction to Android

Android is developed by the Google. There are two giant platforms for the mobile devices Android and iOS. Android is the leading platform as its number of monthly active users are the highest. It is better to choose android not only because of devices being used but it provides open source and fully customizable platform.

Android is Linux based operating system, so it is powerful and supports large number of applications. As an open source operating system means it is free and anybody can use it. As well application development is also free. There are millions of applications on the play store. And having large number of free applications make it reasonable and very popular.

1.2.1 Android Architecture

Android is an operating system and is a stack of software components.

List of the five sections are as under.

- Linux Kernel
- Libraries
- Android Runtime

- Application Framework
- Applications

Below is the picture of Android architecture

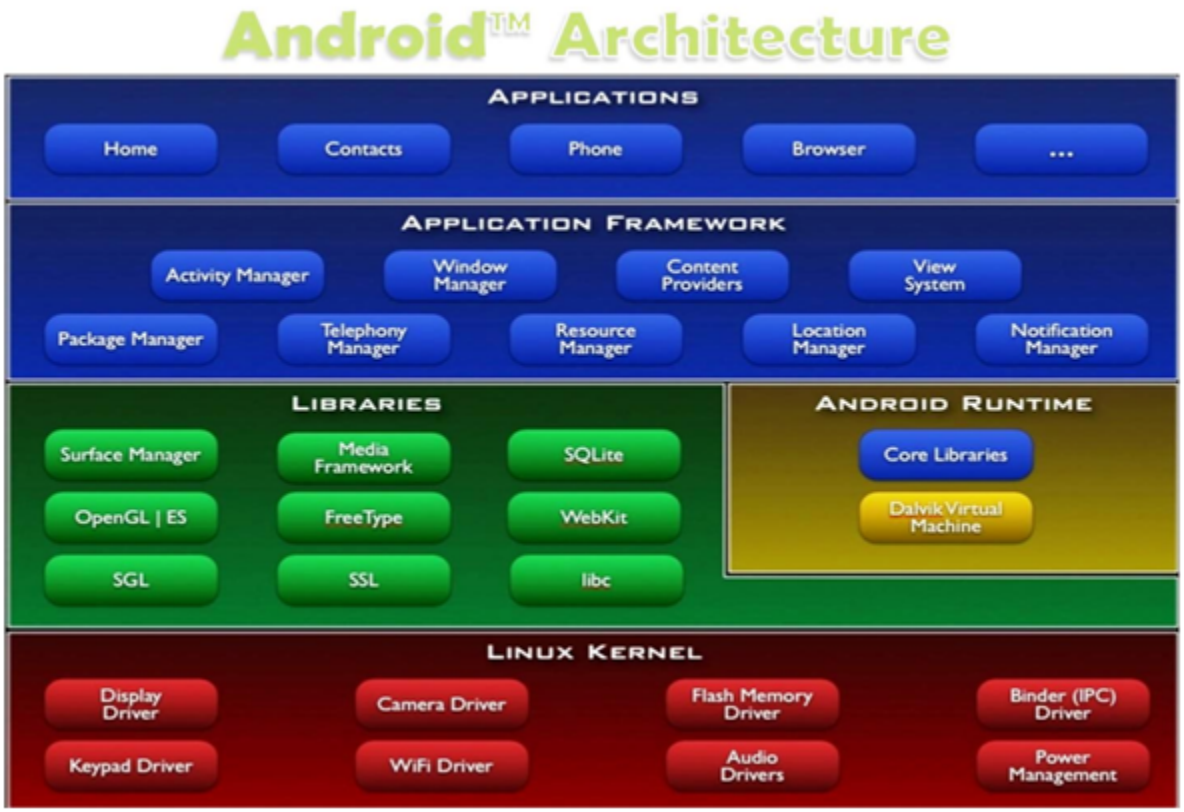


Fig No. 1.2.1: Android Architecture

Linux Kernel:

Android uses Linux kernel and supports wide range hardware. It provides functionalities like memory management, process management and also device management. Camera, display, keypad and many more things are handled by kernel. The Linux is great at networking and it isn't important to interface it to the peripheral hardware. The kernel itself does not interface straightforwardly with the client but instead cooperates with the shell and different programs and also with the hardware devices on the system.

Libraries:

In the upper level of Linux kernel there is a set of libraries like webkit, libc, OpenGL, SQLite and many more. SQLite is a database which is useful for storage and sharing application data. Whereas, SSL libraries are responsible for internet security.

Android Runtime:

This level provides a key component called Dalvik Virtual Machine (DVM), which is specially designed and optimized for android. It is the software that runs apps on android devices.

Application framework:

Application framework layer provides many higher-level services to applications such as app manager, view system, package manager, resource manager and more. As an application developer we are allowed to make use of these services in our application.

Applications:

We can find all the applications in the top layer and we can write application and install on this layer. There are apps like contacts, browsers, services and each of those perform a different role in the overall applications.

1.3 Android Studio

Android studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available to download on macOS, Windows and also Linux based operating systems. Android studio is primary IDE for native android application development. Android studio is open source and we can download it from its website.

1.3.1 Android Studio Features

Current stable version of android studio has following features.

- Android specific refactoring and quick fixes

- Gradle-based support
- Lint tools to catch performance, usability, version compatibility
- Template based wizards to develop android designs and components
- An awesome layout editor, which allows users to drag-and-drop UI components and preview layouts option
- Support for building Android wear apps
- In-built support for integrating with FCM (firebase cloud messaging), Google cloud platform and more.

1.4 Android Emulator

Android application needs an environment on which we can test and try to run our application. Android emulator simulates android device on computer so that developers can test their applications on variety of devices and android API levels without needing to have each physical device.

The emulator provides almost all of the capabilities of a real android device. We can simulate incoming phone calls and text messages, specify the location of the device, simulate different network speeds, simulate rotation and other hardware sensors, access the Google Play Store, and much more.

It is easier and faster to test app on the emulator than doing it on a physical device. The emulator comes with predefined configurations for various android phone, tablet, wear OS, and android TV devices.

Chapter 2: Project Design.

2.1 System Architecture.

Blood Donation is an android application. Main purpose of this application is to connect blood donors and blood seekers in easiest way. Purpose is accomplished by android application by fewest touches possible. Below is block diagram of blood donation application.

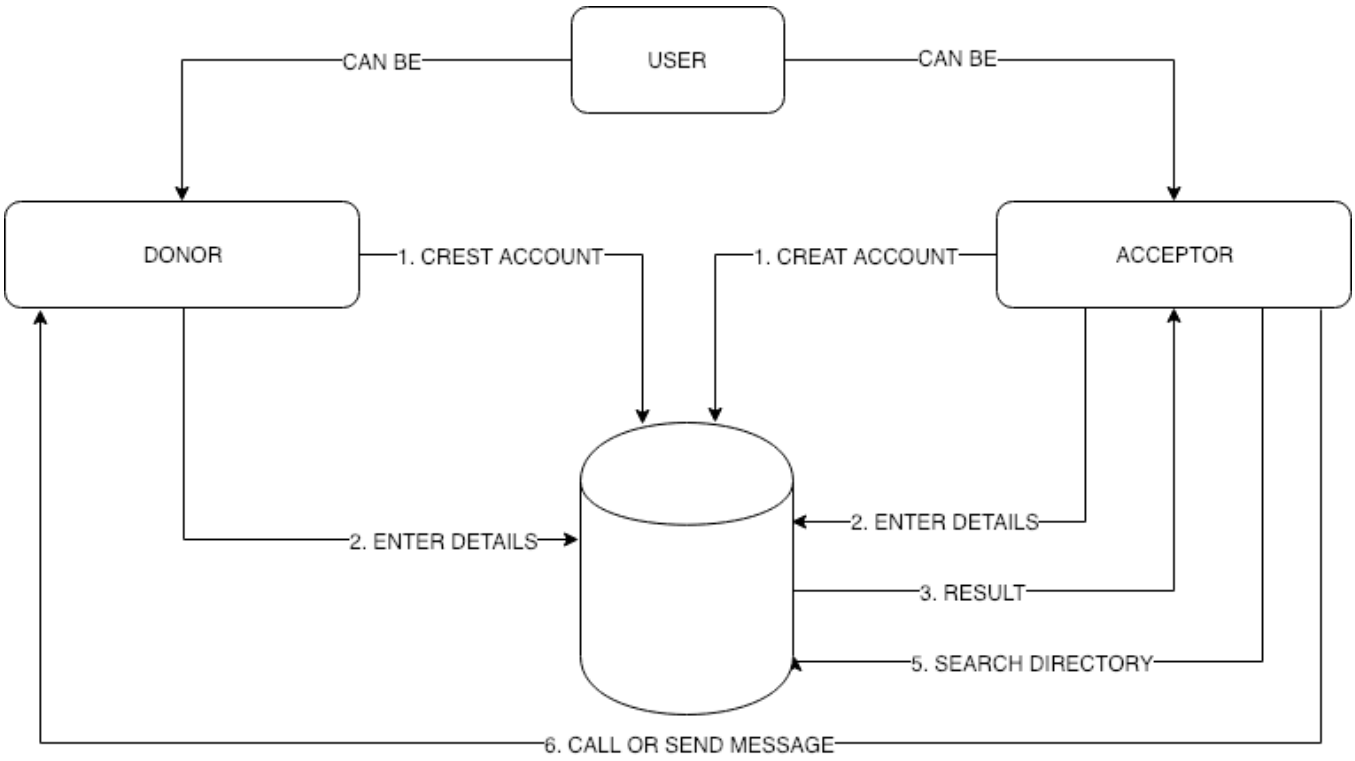


Fig No. 2.1: Block Diagram

Fig 2.1 shows block diagram of blood donation application. Users can be either donor or acceptor. First any user have to create account to start using application. While creating account user needs to enter their personal details. Every users data is connected to the database. Acceptor can search in database for available donors. Donors can update in database, when they are available for donation.

2.2 Use Case Diagrams.

A use case diagram can identify the different types of users of a system and shows the relationship between the user and the different use cases in which the user is involved[3]. We have two actors in this application first Donors and second is Acceptors.

Fig No. 2.2.1 : Use Case Diagram For Seeker/Acceptor

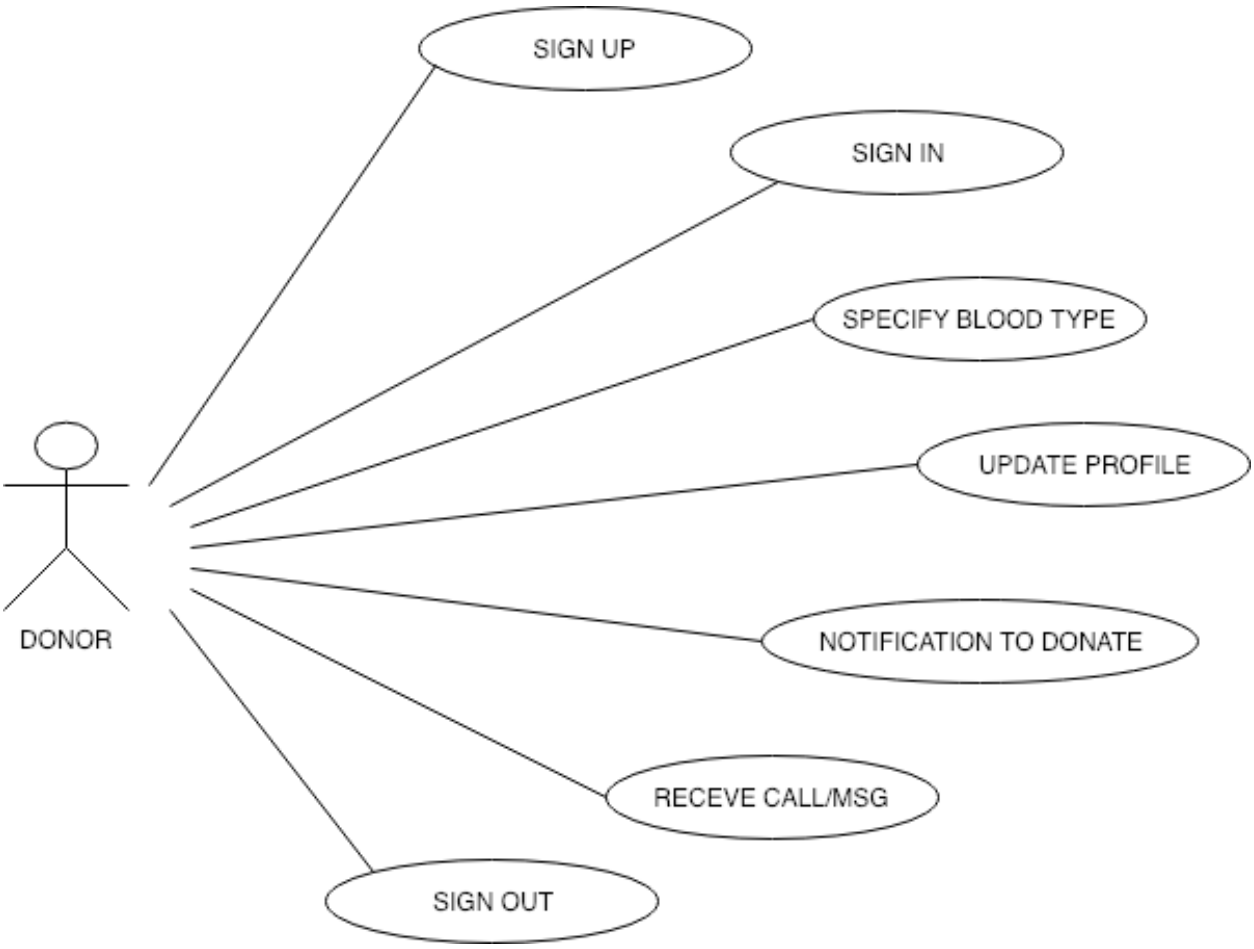


Fig 2.2.2 : Use Case Diagram For Donor

We have individual diagrams for both Donor and Acceptor. Fig 2.2.1 shows Use Case Diagram For Seeker/Acceptor. In which Acceptor can perform sign up, sign in. After that acceptor can search for donors of specific blood type near him/her. After getting donors information they can call or send text to donor.

Donors have to also perform sign up or sign in option in application. And after that they have to update their profile by selecting wether they are available or not. And once they have donated their profile will not be shown for next three months.

2.3 Flow Chart:

A flowchart is a type of diagram that represents workflow or process of the program or whole application. Flowcharts are used in designing and documenting programs. Below are flowcharts for this application[4].

2.3.1 Flow Chart for Sign up.

In fig no. 2.3.1 shows flowchart for registration for users. Every user needs to sign up before donation blood or requesting blood. User can sign up with three different types, using google pulse account, facebook account and using email address. After that user have to provide personal informations like name, age , phone number, zip cod and password. For each filed app makes sure formate of email, password is eight character long and pone number is ten digit long. After filling this informations if every thing is correct and also every fields are filled, Then data is stored in to database or else application shows error. In order to use application every user needs to go through is process.

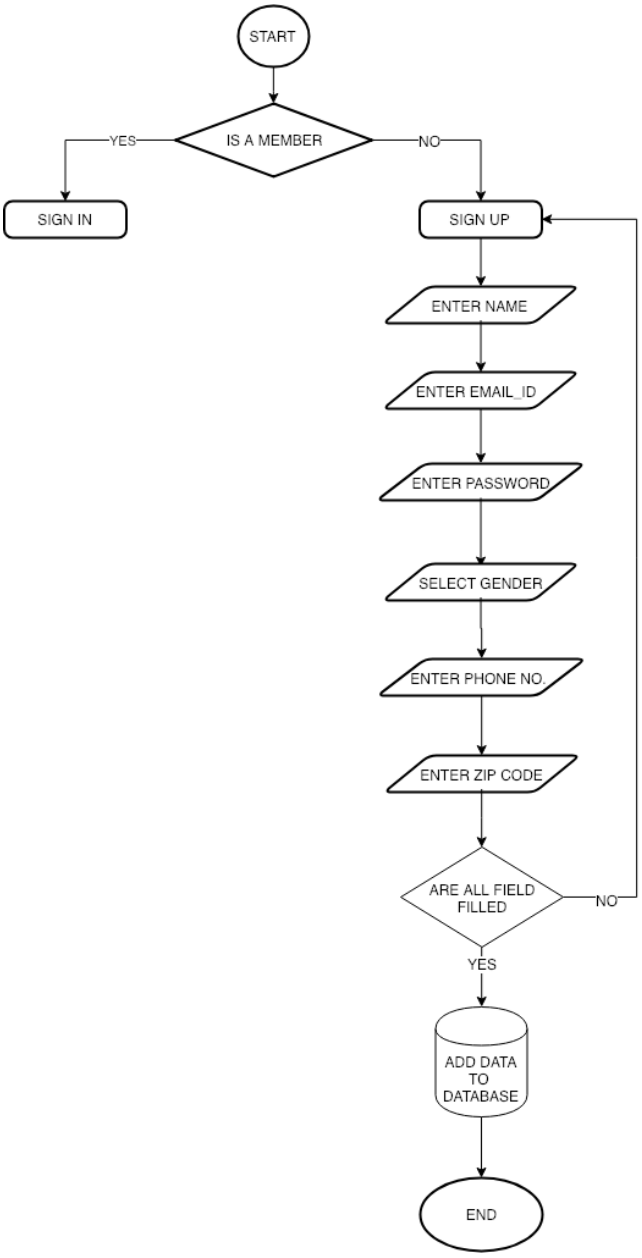
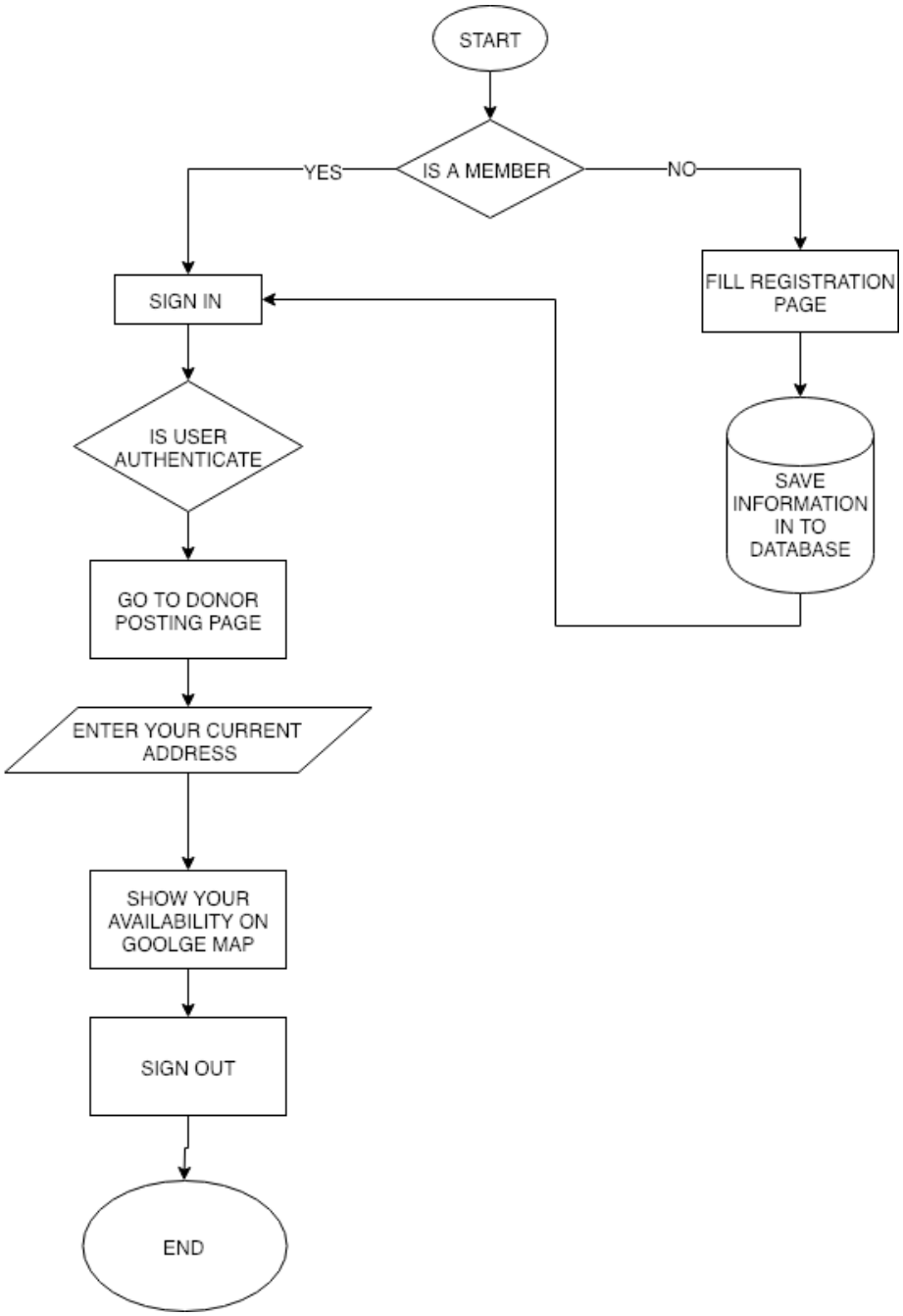


Fig No. 2.3.1 : Flow Chart for Sign up.

2.3.2 Flow Chart for posting availability by donor.

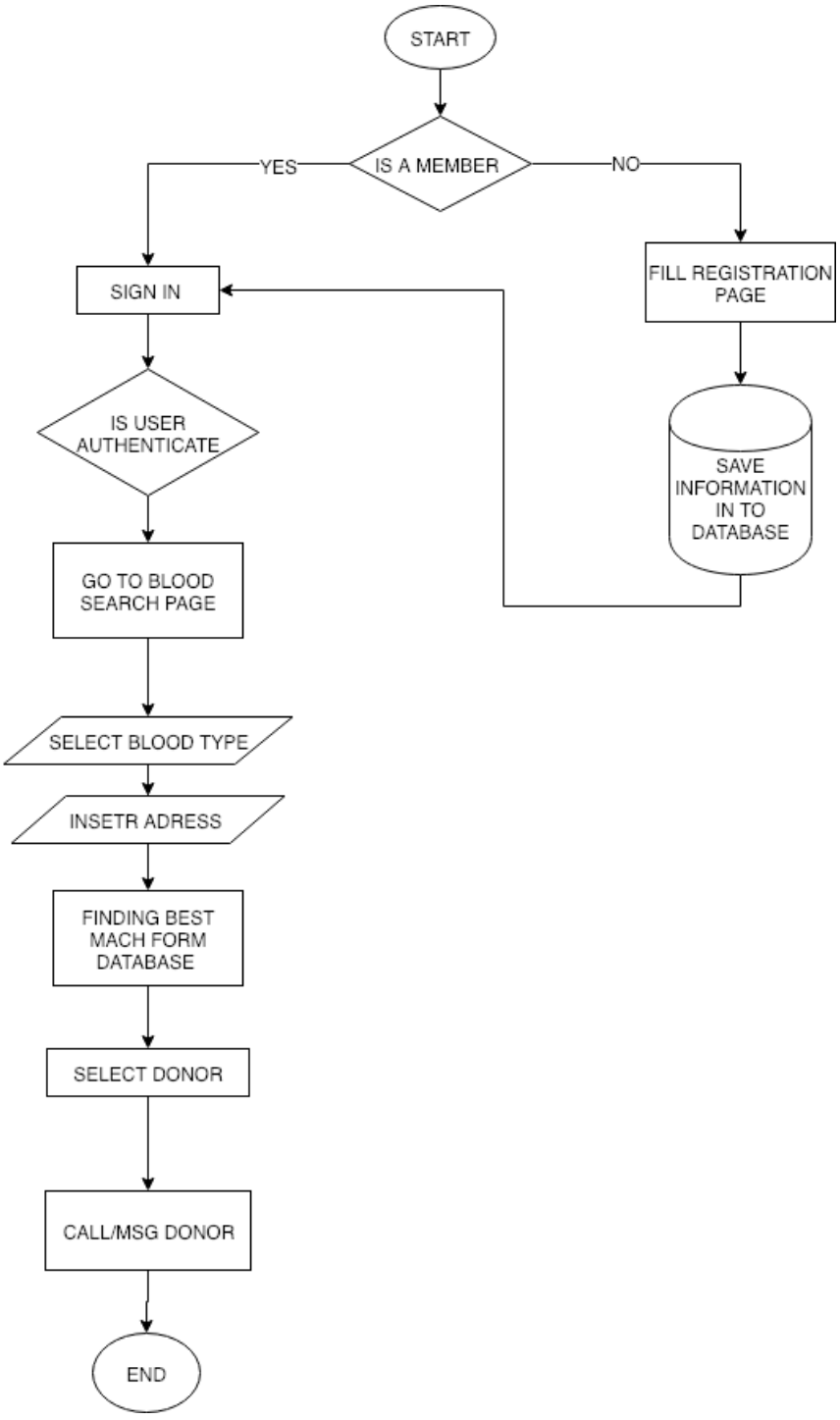
In fig no. 2.3.2 shows flowchart for donors to post they are available for blood donation. As shows in diagram first potential donor needs to sign in to the application.

After that they needs to goto donations window in application. With google maps api user have to enter their address. After that donor can post for blood donation.



2.3.2 Flow Chart for posting availability by donor.

2.3.3 Flow Chart for searching donors.



2.3.3 Flow Chart for searching donors.

In fig no. 2.3.3 shows flowchart for searching donors with specific blood type. User will first sign in to the application and goto the search window in application to see available donors. Then they have to select blood type which they wont. And in google maps and in list app will show nearest potential donors. With this application they can directly contact donors by calling or texting them.

2.4 Data Base :

I have used firebase cloud based database. Firebase is a mobile and web application development platform developed by Google. Firebase offers many tools for web development I have mainly used cloud database and authentication tools.

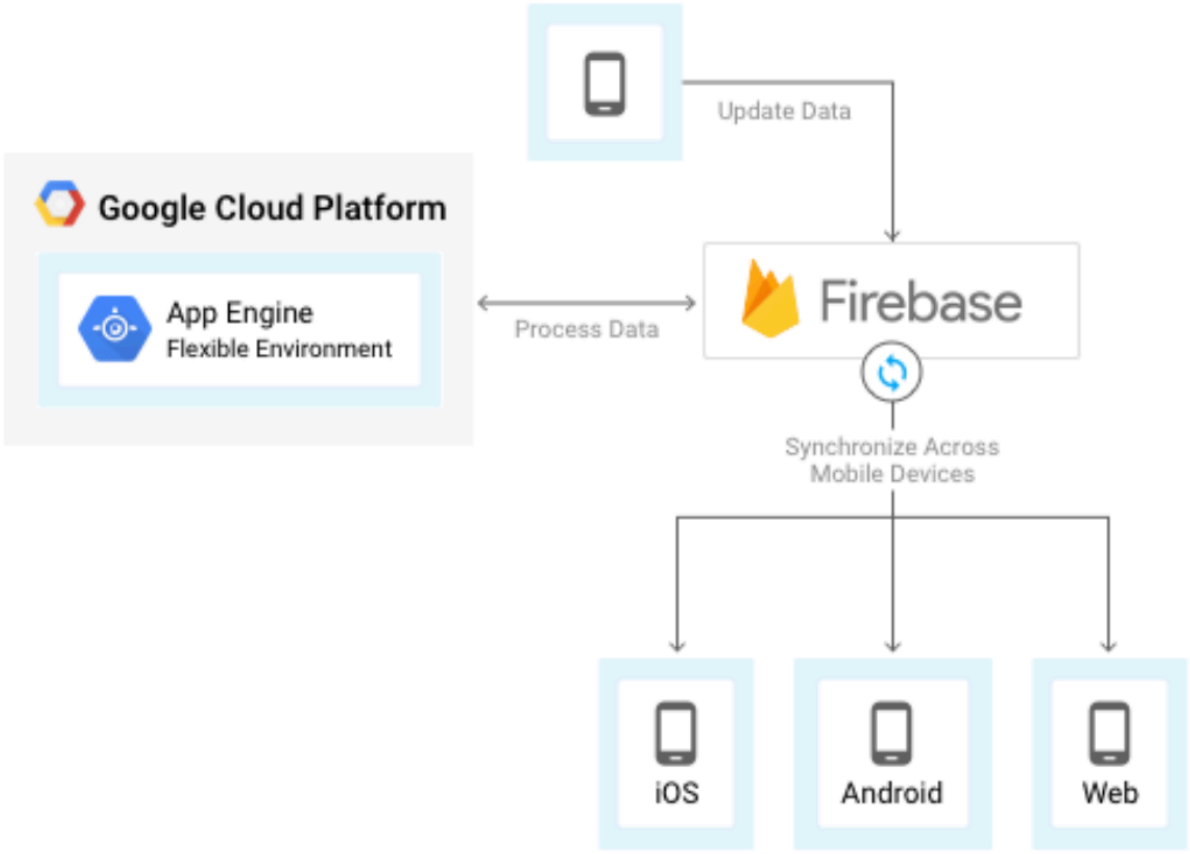


Fig No. 2.4.1: Firebase Architecture

Firebase is no server side programing so every programing and queries are stored on cloud only. It is also real time so whenever user interact with database all changes are directly made on cloud data base. Firebase is also platform independent.

We can interact to same database with different technologies like android application, iOS application and web application. Firebase uses noSQL database so even any of technology goes offline or terminated data will remain on cloud servers.

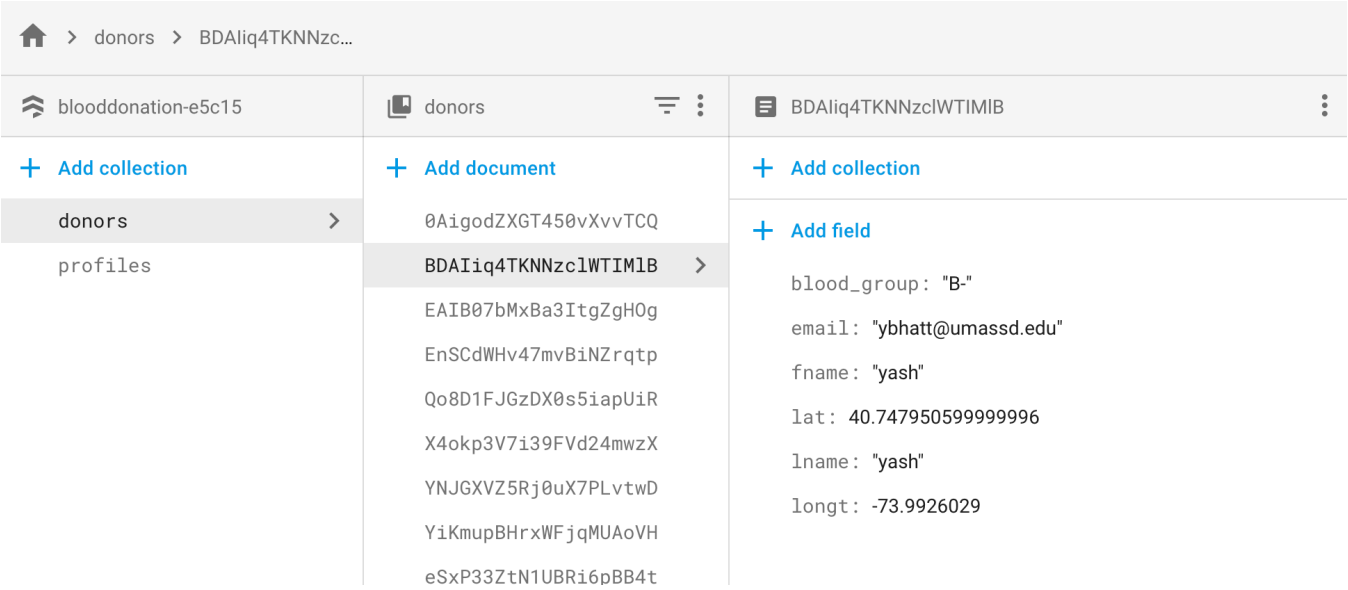


Fig No. 2.4.2: Snapshot of Firebase Database

here is a snapshot of Blood Donation application of firebase. It is relational database model so that every changes happens in donor table those changes will be done on profiles table also. To implement this database I have used some APIs provided by firebase.

Chapter 3: Software Tools, Technologies and APIs

3.1 Software Tools

- Windows, MacOS or Linux based operating system
- J2SE Development Kit (JDK) v7.0+ for development
- Android Studio v2.2+
- Android SDK 21+
- Android Emulator

3.1.1 Operating system

I have used MacOS to develop blood bank android application using android studio. Windows and Linus operating systems also support android development using android studio. MacOS and Linux based OS also supports android development.

3.1.2 Java 2 Standard Edition Development Kit

JDK provides an environment for building application using Java programming language. It is platform independent Because android application development is using java as backend, we need to have JDK in the system. We can also create android application using C++ and kaitlin.

3.1.3 Android Studio

Android studio is an open source integrated development environment (IDE) used to develop android application. Android studio is product of google a must have tool to develop android application. We can use android studio to creating, developing as well debugging our android application.

3.1.3 Android SDK

Android SDK (software development kit) is a set of a development tools used to develop applications for android platform. The android SDK includes required libraries, debugger, an emulator and APIs.

3.1.4 Android Emulator

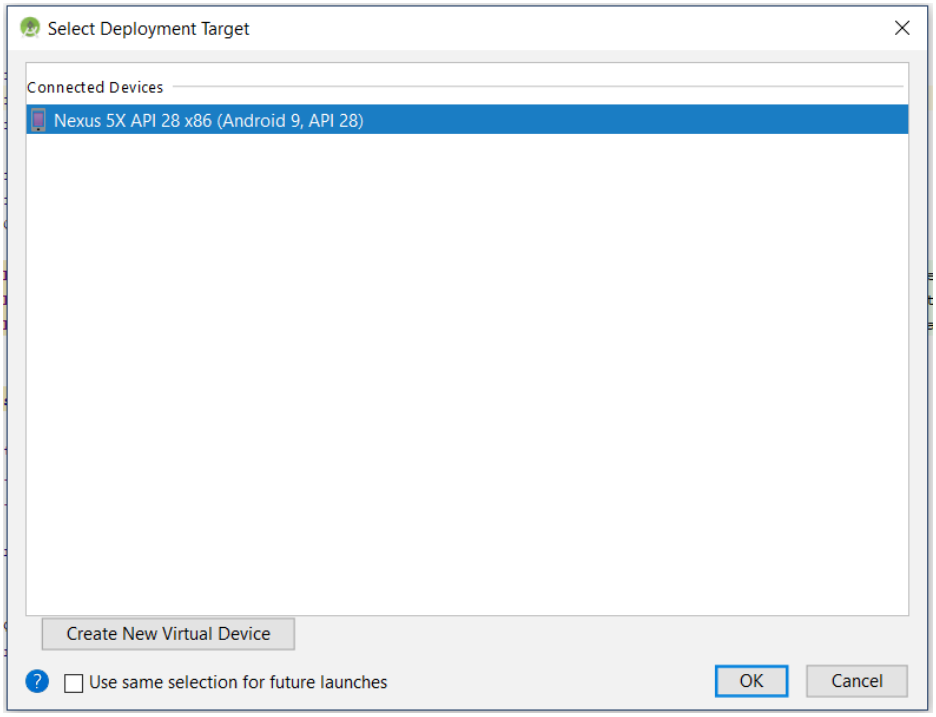


Fig No. 3.1.4: Android Emulator

Android emulator is a way that we can run and test android application on computer. It is also faster and convenient for testing applications than the physical device. We can also test application by creating emulator for different version of androids. We can allocate size of ram, storage and many more things for creating virtual devises. It is also a google tool for android development.

3.2 Installation and Configurations

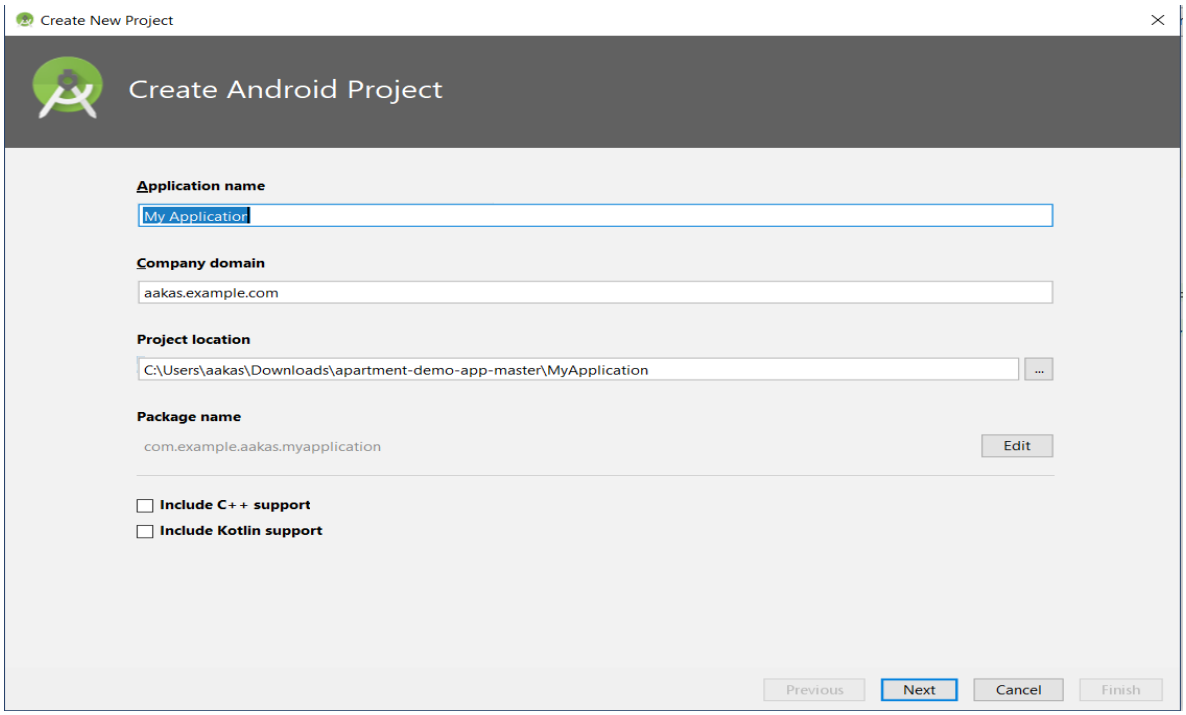


Fig No. 3.2.1: Installation and Configurations

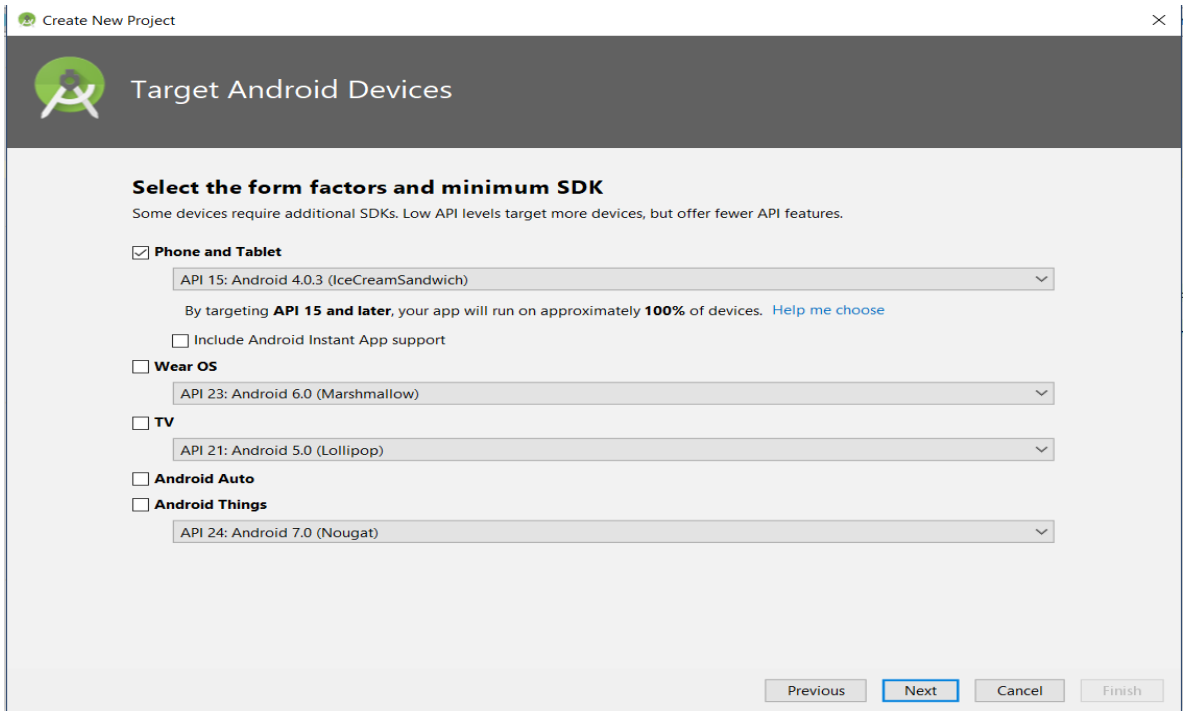


Fig No. 3.2.2: Installation and Configurations

As JDK is required for android development. We need to fist configure java in to our system we can use this link and install latest version of java on our system.

After that we need android studio for application development. We can use this Link to install latest version of android studio. After installing this we need to install many SDKs. which will provide us with google apis and libraries for app development.

While creating new project we need to android version. So that application will work fine after all the versions came after that. and Also we need to provide unique name for our project and where we want to store it.

3.3 Other APIs Used:

Google APIs are different type of APIs(application programming interfaces) provided by Google. It provides us different kinds of functionality to make app development easy and allow to communicate with Google Services and their integration to other services.

3.3.1 FireStore of Firebase.

FireStore is api provided by google and its open source. It provides various queries to communicate with database. CURUD(create, update, read and delete) operations are provided by this API. We have to import below dependences to our MainActivity.java class.

```
import com.google.firebase.firestore.DocumentSnapshot;
import com.google.firebase.firestore.FirebaseFirestore;
import com.google.firebase.firestore.QuerySnapshot;
```

3.3.2 Geofire of Firebase.

Geofire is an open source library for android applications with firebase database. it allows us to store geographical location of the user by storing latitude and longitude.

Geofire helps us to show donors on the google map. this api stores location with lat and longt as string. it is realtime so immediate after user enters their address it will store location into database. And users in need for blood can see donors on the google map. Geofire is light-weighed process to add query results in to firebase database. It helps up to keep applications large real time data processing light weight. We have to import below dependences to our MainActivity.java class.

```
import com.firebase.geofire.core.GeoHash;
```

3.3.3 Google Maps and Places API

We are showing donors on Google map. We are also storing donors address using longitude and latitude. For that Google Maps and Places AIPs is useful to deal with this functionalities. We have to import below dependences to our MainActivity.java class.

```
import com.google.maps.android.clustering.Cluster;
import com.google.maps.android.clustering.ClusterItem;
import com.google.maps.android.clustering.ClusterManager;
import com.google.maps.android.clustering.view.ClusterRenderer;
import
com.google.maps.android.clustering.view.DefaultClusterRenderer;
```

3.3.4 Material edit text API:

AppCompat v21 makes it easy to use Material Design EditText in our apps, but it's so limited. the EditText in Material Design, has more features that Google Material Design Spec has introduced. It provided lot more teachers than EditText provided by Android Studio. We cave to write below code in blokes we want to use this API in our .xml file.

```
'com.rengwuxian.materialedittext:library:2.1.4'
```

Chapter 4: Sequence of Activities

4.1 Android Manifest File.

Android Manifest File is one of the very important file. Android application can not run or start without this application. AndroidManifest.xml File needs to be in applications root directory. The manifest file provides essential information about your app to the Android system.

Among other things, the manifest file provides the following:

- It names the Java package for the application. The package name serves as a unique identifier for the application.
- It describes the components of the application, which include the activities, services, broadcast receivers, and content providers that compose the application. It also names the classes that implement each of the components and publishes their capabilities, such as the Intent messages that they can handle.
- It determines the processes that host the application components.
- It declares the permissions that the application must have in order to access protected parts of the API and interact with other applications.
- It declares the minimum level of the Android API that the application requires.
- It lists the libraries that the application must be linked against.
- launcher activity are declared this file so android system can know on start up which activity to show.

In our AndroidManifest.xml we have declared that on startup it will first show splash activity. So android system will find java file and .xml file of splash activity on start up. After that we can declared two more important activities in AndroidManifest.xml file which are Registration activity and main activity. If user is new to app it will go through registration activity and if user have already logged in in

same android devise it will go through main activity class. Many more important things are declared in AndroidManifest.xml file the thins we have discusses above.

```
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:tools="http://schemas.android.com/tools"
    package="com.yashbhatt.bloodbank">

    <application
        android:name=".BloodBank"
        android:allowBackup="true"
        android:icon="@mipmap/ic_launcher"
        android:label="@string/app_name"
        android:roundIcon="@mipmap/ic_launcher_round"
        android:supportsRtl="true"
        android:theme="@style/AppTheme"
        tools:ignore="GoogleAppIndexingWarning">

        <uses-library android:name="org.apache.http.legacy"
android:required="false" />
        <meta-data
            android:name="com.google.android.geo.API_KEY"
            android:value="@string/map_key"/>

        <activity
            android:name=".SplashActivity"
            android:label="@string/app_name"
            android:screenOrientation="portrait"
            android:theme="@style/AppTheme.NoActionBar">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />

                <category
android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>

        <activity
            android:name=".RegistrationActivity"
            android:screenOrientation="portrait" />

        <activity
            android:name=".MainActivity"
            android:screenOrientation="portrait" />
    </application>
```

4.2 Android Activités classes.

In this Application we have MainActivity.java and RegistrationActivity.java file which also plays very important role in android system. This files are listed in AndroidManifest.xml. And this .java files extends AppCompatActivity.class and We have to @override some of the methods from AppCompatActivity.class. We have to @override methods like

```
protected void onCreate(Bundle savedInstanceState);
public void onBackPressed() ;
public boolean onNavigationItemSelected(MenuItem item);
public void onClick(View v);
protected void onResume() ;
public void onComplete(@NonNull Task<QuerySnapshot> task) ;
```

This are only some of the main examples of methods that we have @overRiden In this application. apart this there are many machos with are used in application.

4.3 Every Window in this application.

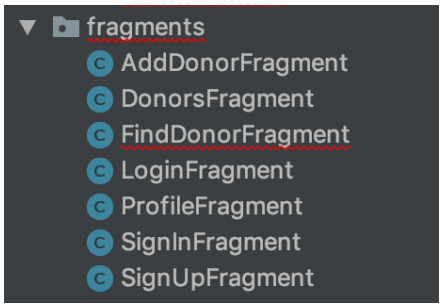


Fig No. 4.3.1

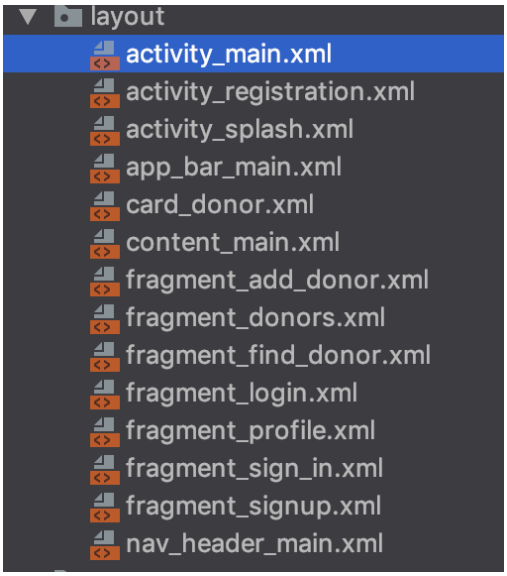


Fig No. 4.3.2

Each .xml file is associated with a .java file. Xml files are used to create user interface of the application. But all main work is done in .java file like storing data creating methods to do some particular work getting data from database and many more. Activity lifecycle is also maintained in this .java file. Above is some of my .java file and .xml files.

All activities, fragments and layouts are show in figure below. It shows snapshots of .xml files. This will help to understand the flow of the application. And from window to window transection in application. This are screenshots taken from real android phone on emulator.

As we open application it will show splash screen for 1500 milliseconds. The code for splash screen is SplashActivity.java class and activity_splash.xml.

When user will open application for first time after installation This will send user on log in page. Where user can sign in using Google plus, Facebook account or using their email address.

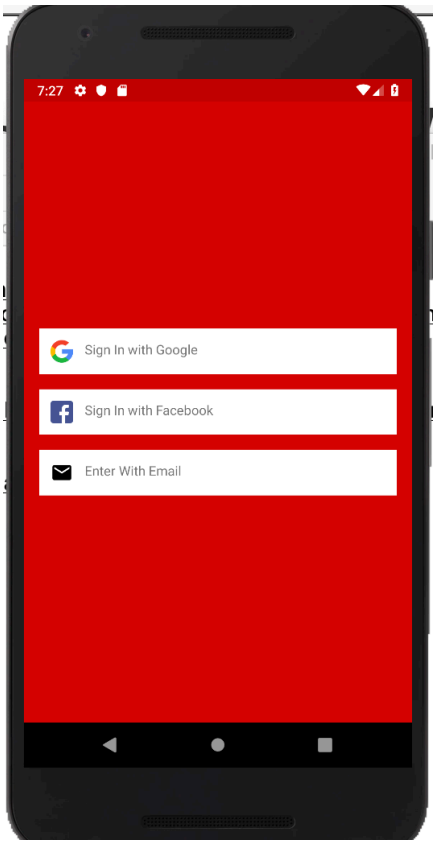
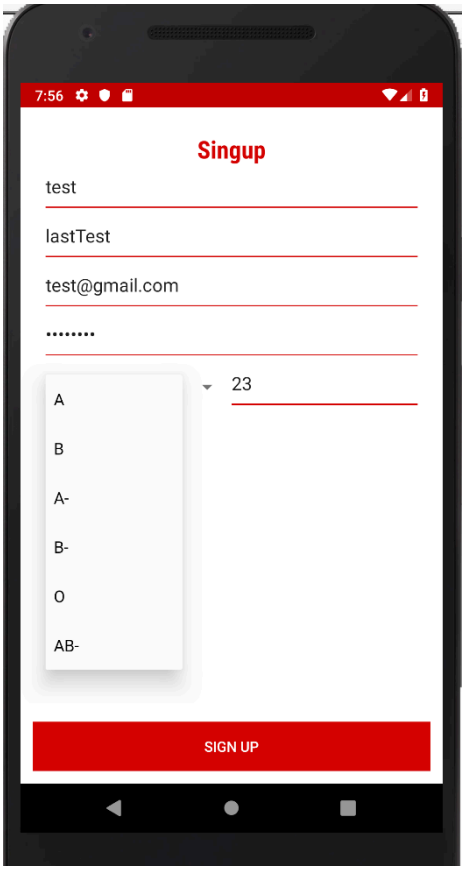


Fig No. 4.1 : Screen 1

After that if a user is already a member they can log in with their information. And if the user is new and not a member. they can sign up. To sign up they have to provide their personal information to register in application. Once it is done data is stored in to firebase database. once user has reseter and user reopens application in the same device user don't need to go through log in or registration process.



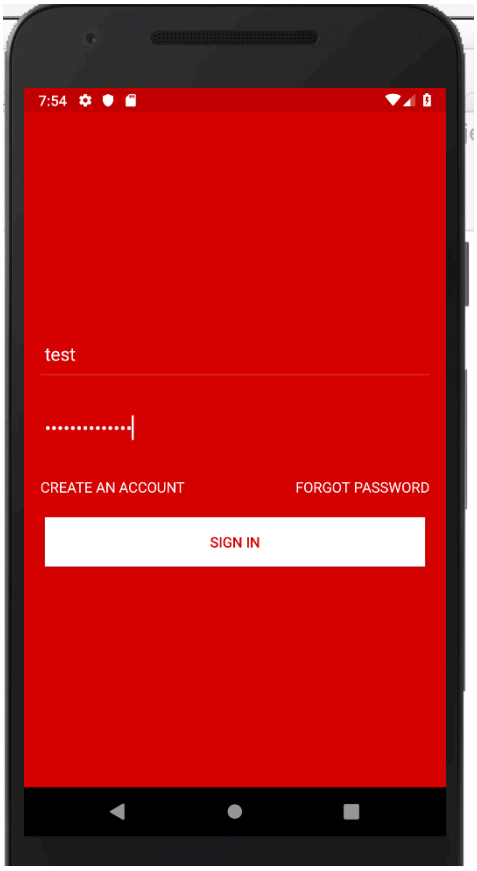


Fig No. 4.2 : Screen 2

Fig No. 4.3 : Screen 3

After successfully signing up or sign in application will show donors on google map. I have used clustering to show donors. In near area if there are more than one donors application will show donors as group and as we zoom into the map donors will disperse. And it will show red drops as individual donors. Once user tap on any red

drop maps will show users information and user can choose to see direction to the donor.

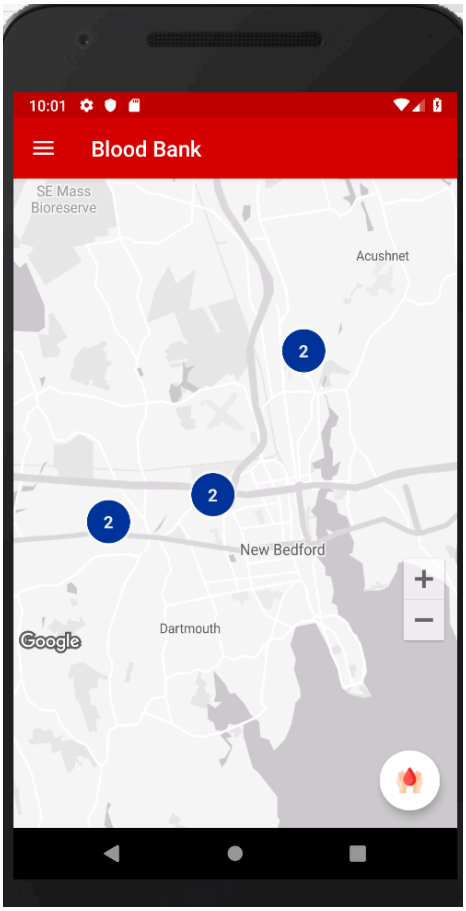


Fig No. 4.4 : Screen 4

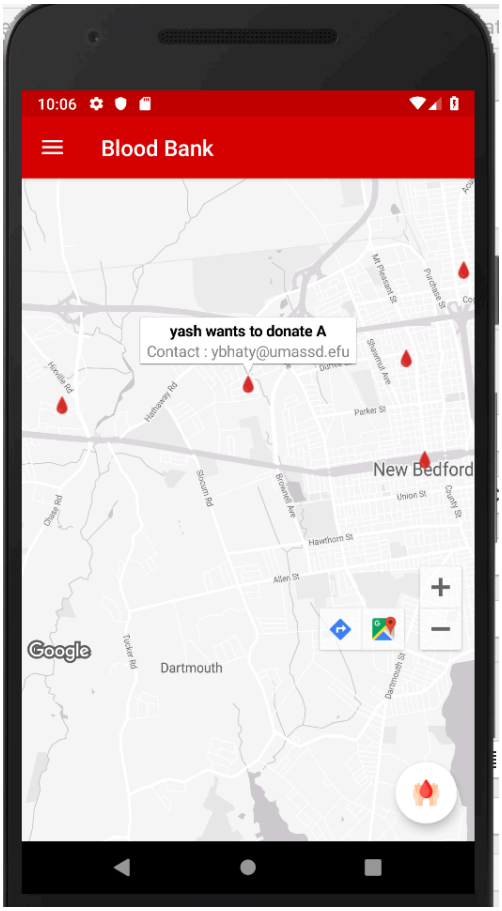


Fig No. 4.5 : Screen 5

To find donor of particular blood type user have to go into menu and tap on find donors option. After that user have to select blood type. List of donors with that blood type will be shown on screen as well on map with donors name and contact information. From there acceptor can directly contact donor or see the directions to the donor.

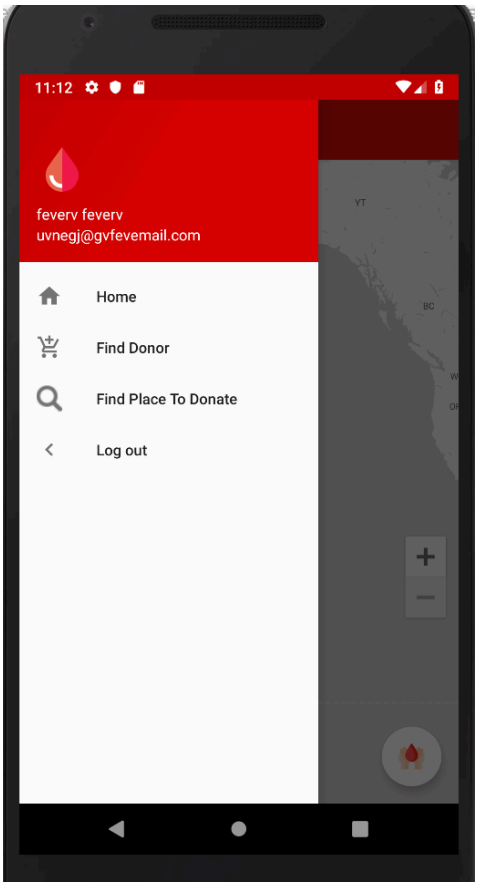


Fig No. 4.6 : Screen 6

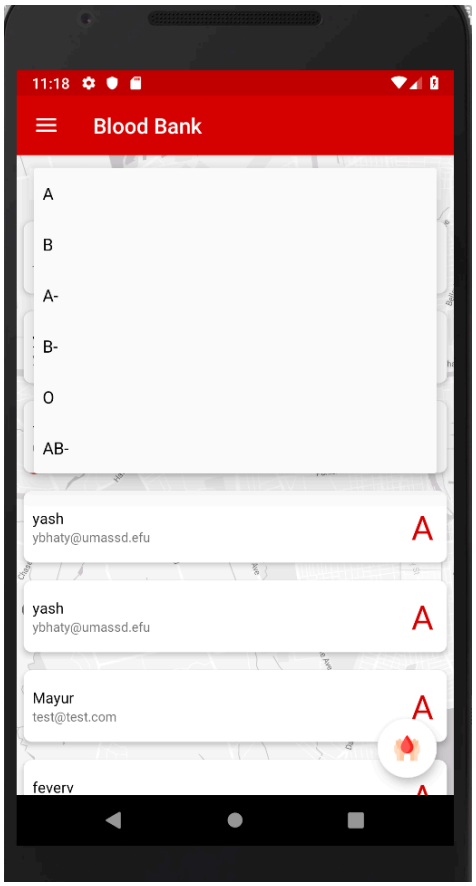


Fig No. 4.7 : Screen 7

From menu user can also find nearby places to donate blood in google search like blood donation camps and hospitals near donor. Apart from that user can log out as well. And all the transition of windows like pressing back button to go back to previous window works nicely.

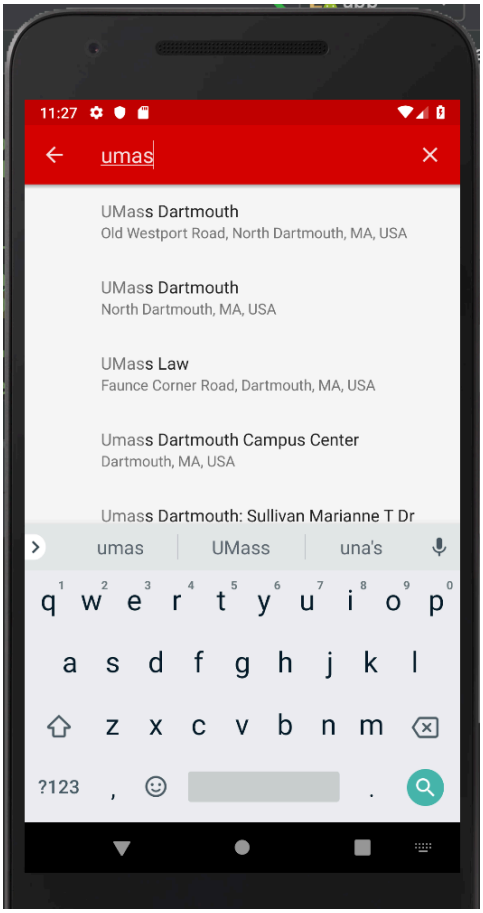


Fig No. 4.8 : Screen 8

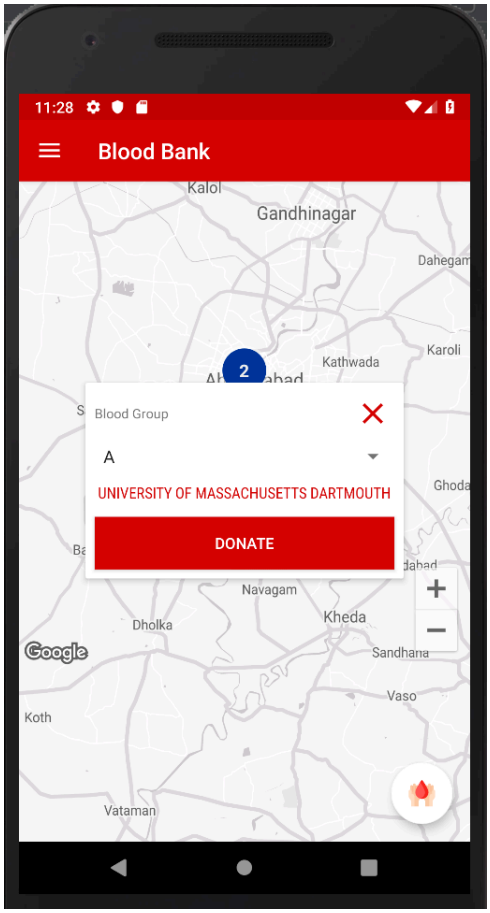


Fig No. 4.9 : Screen 9

To post arability for donation by user can be done by taping on red drop and hands icon on bottom right corner of the screen. Then application will ask to enter address for entering address i have used google map api so it will show list of suggestions to select address. And then just press donate and donors information will be stored in database and acceptors can also see donor on map. After three months donors will receive reminder for donating blood.

Chapter 5: Difficulties, Conclusion and Future work

5.1 Difficulties

In initial phase of the project i did not face any difficulties. As i moved foreword i had some issues with SDKs versions and i was getting some errors which to time to resolve. Apart from that as firebase is a new cloud based database technology i had to do some research in depth for that.

I am using googles map APIs and some of those APIs got updated after i implemented them and according to updated API i had to do some changes in my code.

I was planing to develop application in such a say that with only one source code and some changes application run on both platforms iOS as well Android. along with developing android application I did research on cross platform mobile development for iOS and Android. But i couldn't find detailed documentations with examples. I am still working on cross platform mobile development.

5.2 Conclusion

Blood donation is one significant contributions to society. Blood donation application will help to connect donors and people in need of blood. This application has simple functionality so any one with android phone and internet connection can use it.

This is location based application so it shows donor near user on map. And This app also shows directions to the donor. We can use this application to promote blood donation also. User interface and visualization of donors is simple and easy to understand.

5.2 Future work

The Blood Donation application can save life. It makes easy to reach out for blood in community. Blood donation is wonderful project we can add many many things to current project.

This is an android application in further we can create iOS application. And we also need to reach web based application for majority of the people can use blood donation application. I have used firebase for database. So using firebase we can easily connect iOS application and web based application to to database and database will be shared in this three platforms.

To encore donors we can start reword system on blood donation. And We can connect application with social media so donors can post their photos donating blood on social media like facebook, instagram and twitter.

We can add feature with which we can share donors databases with hospitals so they can also contact donors directly in emergencies.

We can add feature which allows users to create group of donors and add leaderboard in application to encourage people.

References

[1] https://www.who.int/features/qa/61/en/
[2] http://givingblood.org/about-blood/history-of-blood-banking.aspx
[3] https://en.wikipedia.org/wiki/Use_case_diagram
[4] https://cloud.google.com/solutions/mobile/mobile-app-backend-services#firebase-appengine-standard
[5]https://cloud.google.com/solutions/mobile/mobile-app-backend-services#firebase-appengine-standard
[6] https://en.wikipedia.org/wiki/Software_development_kit
[7] https://developer.android.com/studio/
[8] https://en.wikipedia.org/wiki/Android_(operating_system)
[9]https://www.researchgate.net/figure/Lifecycle-of-Activity-in-Android-from-6_fig1_241633074
[10] https://developer.android.com/guide/
[11] https://www.tutorialspoint.com/android/android_fragments.htm
[12] https://www.quora.com/What-is-the-purpose-of-an-Android-application-manifest-file
[13] http://www.academia.edu/17573428/Online_Blood_Donation_management_System_report