mGuide Android Application

A report submitted for the course named Project I (CS-200)

By

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Abstract

In this work, mGuide Android Application is a first of its kind application which retrieves user realtime location and if the user is standing or walking at a famous/historical place, tells him/her all the information and Historical significance and guide him/her through that area using voice assistance as well as text. This application can be used as a **Virtual Guide**.

This application is a boon for blind and deaf people who want to be independant Traveller and also eliminate the purpose of hiring tourist guides who charges high fee for guidance. This Application can be used to boost tourism sector for any country.

Keywords - Database management, Location processing, Text to Speech

Declaration

I declare that this submission represents my idea in my own words and where others' idea or words have been included, I have adequately cited and referenced the original source. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/sources in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from proper permission has not been taken when needed.

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To Whom It May Concern

This is to certify that the report entitled **"mGuide Android Application"** submitted by **"Naman Singhal"**, has been carried out under my supervision and that this work has not been submitted elsewhere for a degree,diploma or a course.

Signature of Supervisor

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This is to certify that the report entitled **"mGuide Android Aplication"** submitted by **Mr. Naman Singhal**, has been successfully evaluated and that this work has not been submitted elsewhere for a degree, diploma or a course.

Signature of HoD

Dr. Kishorjit Nongmeikapam

Signature of Examiner 1: _____

Signature of Examiner 2: _____

Signature of Examiner 3: _____

Signature of Examiner 4: _____

Acknowledgement

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I owe my deep gratitude to my project guide **Dr. Kishorjit Nongmeikapam**, who took keen interest on our project work and guided us all along, till the completion of our project work by providing all the necessary information for developing a good system. I am thankful to and fortunate enough to get constant encouragement, support and guidance from my Parents and Friends which helped me in successfully completing my project work. Also, I would like to extend our sincere esteems to all staff in laboratory for their timely support.

- Naman Singhal

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List of abbreviations

		A
app	Application	

		D
DB	Database	
DBMS	Database Management Systems	

		X
XML	eXtensible Mark-up Language	

Chapter 1

Introduction

"True navigation begins in the human heart. It's the most important map of all.

– Elizabeth Kapu'uwailani Lindsey

Tourist and Historical places are the most Important places for any country. They depict many different cultural, religious, architectural, and technological development of that country. They play a vital role in boosting a country's economy. Tourism sector have a major part in the GDP of the country. Tourist Guide plays an Important Role in these location by providing all the information about that place to their customers. Total Tourism Contribution by Travel and Tourism Sector in India's GDP is expected to increase from 16.35 trillion in 2019 to 32.05 trillion in 2028 [1].

Research in Indoor Navigation is Increasing day by day and with the development in Artificial Intelligence.

1.1 Outline of the report

This report is organised around three main parts.

Chapter 2 describes the study of Existing System

Chapter 3 presents the System Analysis and Architectural Design

Chapter 4 describes the Implementation And Testing.

Chapter 5 states the conclusion of the project.

1.2 Location Detection

Nowadays every individual owns a smart phone and every smart phone has a service known as GPS which is used to detect the location of the user whether the user is standing, walking, running or travelling. Geolocation is the ability to track a device's whereabouts using GPS, cell phone towers, WiFi access points or a combination of these. Since devices are used by individuals, geolocation uses positioning systems to track an individual's whereabouts down to latitude and longitude coordinates, or more practically, a physical address. Both mobile and desktop devices can use geolocation.

[1] https://www.ibef.org/industry/indian-tourism-and-hospitality-industry-analysis-presentation

1.3 Guidance through Location

Back in the 1530s, guidance started out meaning ”the process of directing conduct,” similar to what we think of when we think of parents, mentors, or counselors. If you’ve ever asked a friend for advice on what to wear, you were seeking their guidance. But guidance also applies to physical direction. We might use a global positioning system (GPS) for guidance when we drive. Years ago, sailors relied on the stars for guidance. Sherpas provide guidance to climbers hiking Mt. Everest so they don’t get lost. Location Detection can be used to Guide the user through a particular area using voice assistant [1].

1.4 Gantt chart

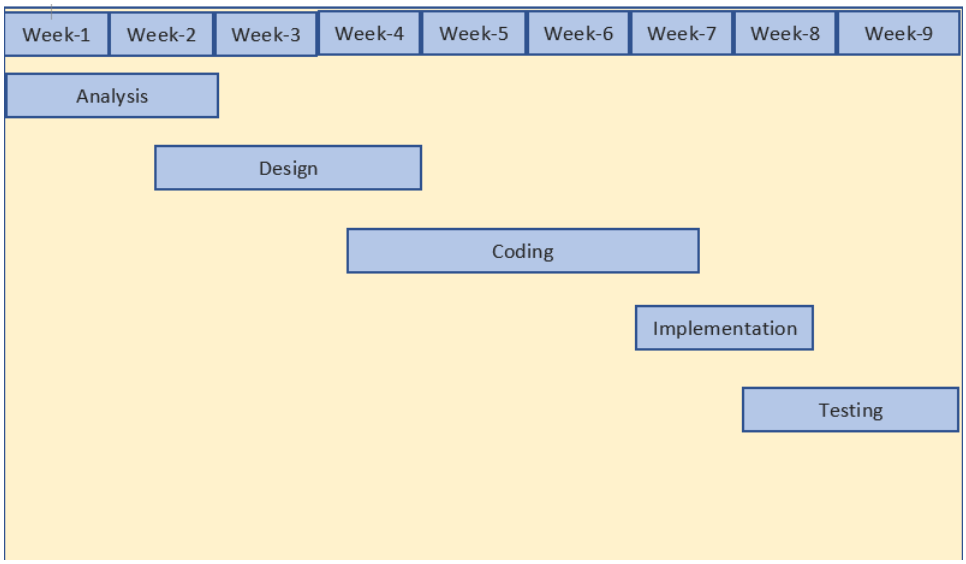

Figure 1.1: Gantt Chart

The Figure 1.1 shows the steps taken to implement the application. The area which is under cream shadow represents the work that has been done until that week. The whole application implementation was divided into five steps as shown in the figure. It can be observed that some part of each phase was parallelly done.

Chapter 2

Existing System Study

2.1 Introduction

Available Commercial Tourist Guide Systems shown in Table 2.1 (Some of these Web sites may have changed or been removed.) (The identification of any company, commercial product, or trade name does not imply endorsement or recommendation by the National Institute of Standards and Technology or any of the authors or their institutions.)

Table 2.1: Commercial products Websites

1.	India Tourist Guide App	https://play.google.com/store/apps/details?id=com.vivajaipur.tourist
2.	Indoor Google Maps	https://www.google.com/maps/about/partners/indoormaps/
3.	Pocket Guide App	https://play.google.com/store/apps/details?id=hu.pocketguide

2.2 India Tourist Guide App

This guidance app shows information about every Indian tourist locations like Near place, Map, Direction, location information. It also shows information like address, timing for visits. Recent pics of the place to be shown when we click on location details. It also shows you how to reach that place through Google Maps. [1].

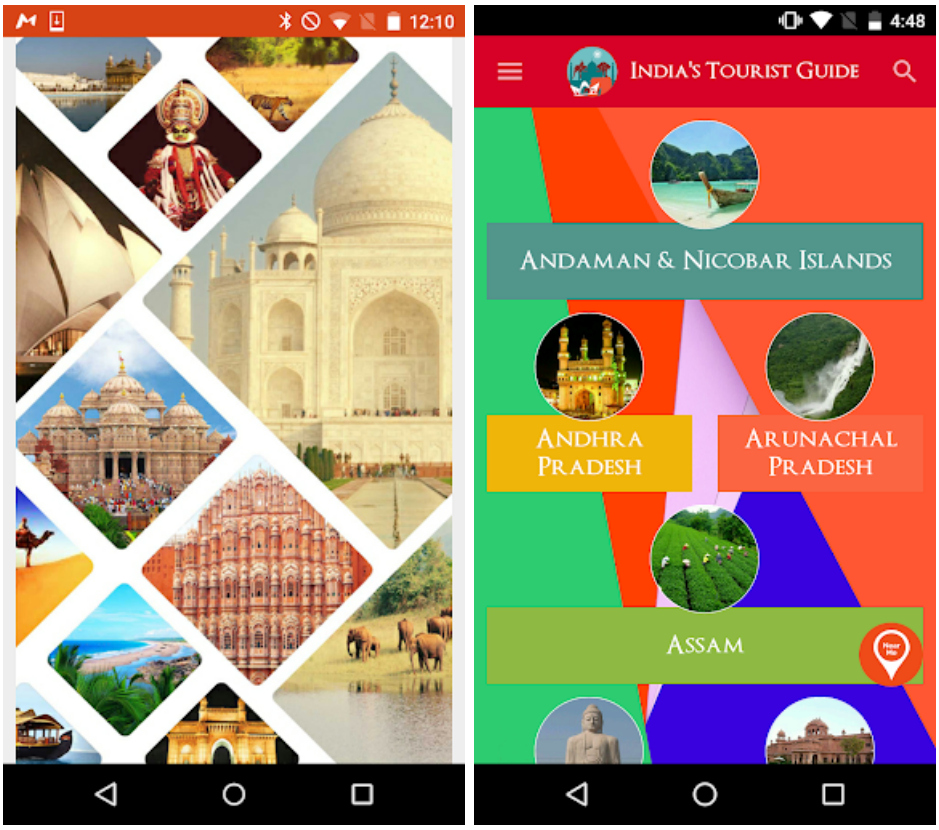

Figure 2.1: India Tourist Guide App

Features

- uses Google place API
- Uses Google Maps API

[1] https://play.google.com/store/apps/details?id=com.vivajaipur.tourist&hl=en_IN

- Uses Google Direction API
- It helps you manage your trips
- It has Beautiful UI/UX Design

Programming and development

- Uses Android Architecture Components for a Powerful App.

2.3 Indoor Google Maps

[2] In March 2011, Google Maps added indoor maps, which gave the users the ability to navigate themselves within buildings such as airports, museums, shopping malls, big-box stores, universities, transit stations, and other public spaces (including underground facilities). Google encourages owners of public facilities to submit floor plans of their buildings in order to add them to the service. Map users can view different floors of a building or subway station by clicking on a level selector that is displayed near any structures which are mapped on multiple levels.

Features

- When a user searches for a business, the results are downloaded in the background for insertion into the side panel and map; the page is not reloaded.
- Locations are drawn dynamically by positioning a red pin (composed of several partially transparent PNGs) on top of the map images.
- A hidden IFrame with form submission is used because it preserves browser history
- It has Beautiful UI/UX Design

Programming and development

- Google Maps uses JavaScript extensively.
- The site also uses JSON for data transfer rather than XML, for performance reasons.

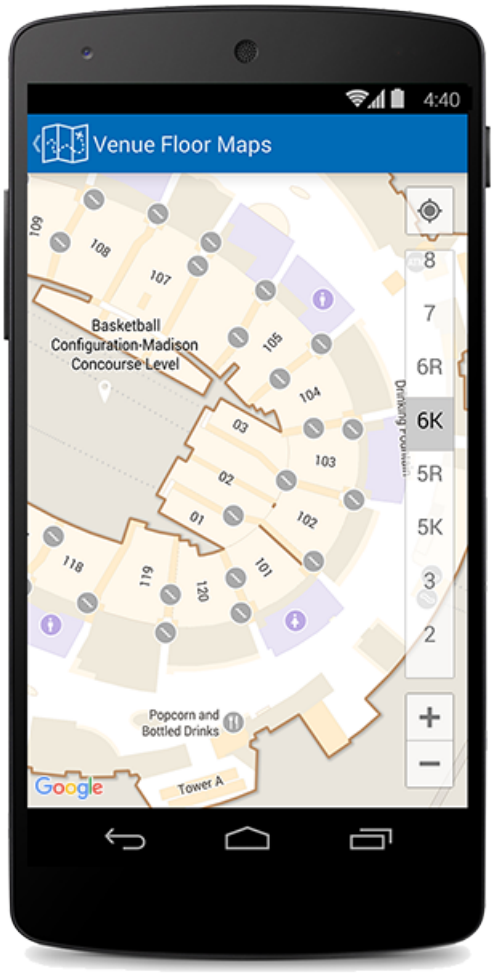

Figure 2.2: Google Indoor Maps

2.4 Pocket Guide App

[3]The app guides you through the city by voice, using your GPS location.It creates the tour of the whole city for the user. It tells the user about the story and a brief description of the monument/place where he is standing. It doesnot tells the user anything inside that monument/place in the city.

Figure 2.3: Google Indoor Maps

Features

- uses Google place API
- Uses Google Maps API
- Uses Google Direction API
- It helps you manage your trips
- It has Beautiful UI/UX Design

Programming and development

- Uses Kotlin Programming Language
- Uses Android Architecture Components for a Powerful App.

2.5 Summary

In this chapter, There were three popular applications which give information to the user for a particular place but they do not guide them and tell them the significance of that place where the user is currently standing or walking inside a famous/historical building. mGuide Android Application is a breakthrough application in these areas.

Chapter 3

System Analysis & Design

3.1 System Analysis

It is a process of collecting and interpreting facts, identifying the problems, and decomposition of a system into its components.

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish

their purpose.

Analysis **specifies what the system should do**.

3.1.1 Tourism

Tourism is is the act of travelling for pleasure or business; also the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists, and the business of operating tours. Tourism may be international, or within the traveller's country. The World Tourism Organization defines tourism as "beyond the common perception of tourism as being limited to holiday activity only", as people "traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure and not less than 24 hours, business and other purposes".

Tourism is the important source of income for most of the countries like France, New Zealand. Tourism sector have its direct effect on the social, cultural, economic sectors of the society and on their international relations.

Tourism generates large amount of income in the form of goods and services needed by tourists. It generates employment opportunities in the service sector associated with tourism.

In India, tourism is important for the country's economy and is growing rapidly. The World Travel and Tourism Council calculated that tourism generated 16.91 lakh crore (US$240 billion) or 9.2% of India's GDP in 2018 and supported 42.673 million jobs, 8.1% of its total employment. The sector is predicted to grow at an annual rate of 6.9% to 32.05 lakh crore (US$450 billion) by 2028 (9.9% of GDP)[1].

3.1.2 Tourist Guide

A tour guide (U.S.) or a tourist guide (European) is a person who provides assistance, information at Historical,famous place/monument, place of attraction, museums or at a

[1] https://en.wikipedia.org/wiki/Tourism_in_India

religious site.

Nowadays due to increasing unemployment rate in the world, people are opting to become a tourist guide to run their house but they lack proper knowledge, history, significance of the place and some of them are charging very high fees which is not worth of. They take advantage of foreign visitors and ask them extremely high fees for guidance.

3.2 Architectural Design

It is the process of understanding the environment in which a proposed system or systems will operate and determining the requirements for the system. The Design of the application is the most important part in the project. The Popularity of an application depends on how user-friendly your application is. The input or requirements to the analysis activity can come from any number of stakeholders and include items such as:

- What the system will do when operational (the functional requirements)
- How well the system will perform runtime non-functional requirements such as reliability, operability, performance efficiency, security, compatibility defined in ISO/IEC 25010:2011 standard.
- Development-time non-functional requirements such as maintainability and transferability defined in ISO 25010:2011 standard.
- Business requirements and environmental contexts of a system that may change over time, such as legal, social, financial, competitive, and technology concerns.

The outputs of the analysis activity are those requirements that have a measurable impact on a software system's architecture, called architecturally significant requirements.

3.2.1 Context Diagram

In the context diagram output and input to the system is defined. In this the input is the realtime location of the userthrough GPS Service of the Android Device. The output of the app is the Voice Assistant which speaks about the place where user is currently standing or walking . The Figure 3.1 represent the input and output of the system.

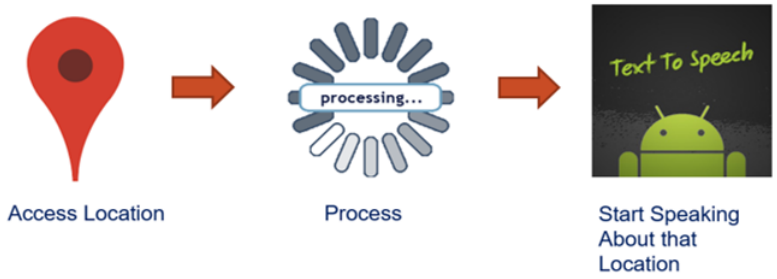

Figure 3.1: Input and Output of the System

3.2.2 1st level DFD

The Figure 3.2 shows the detail design of the system. The whole system is divided into 5 process and a databse is used.

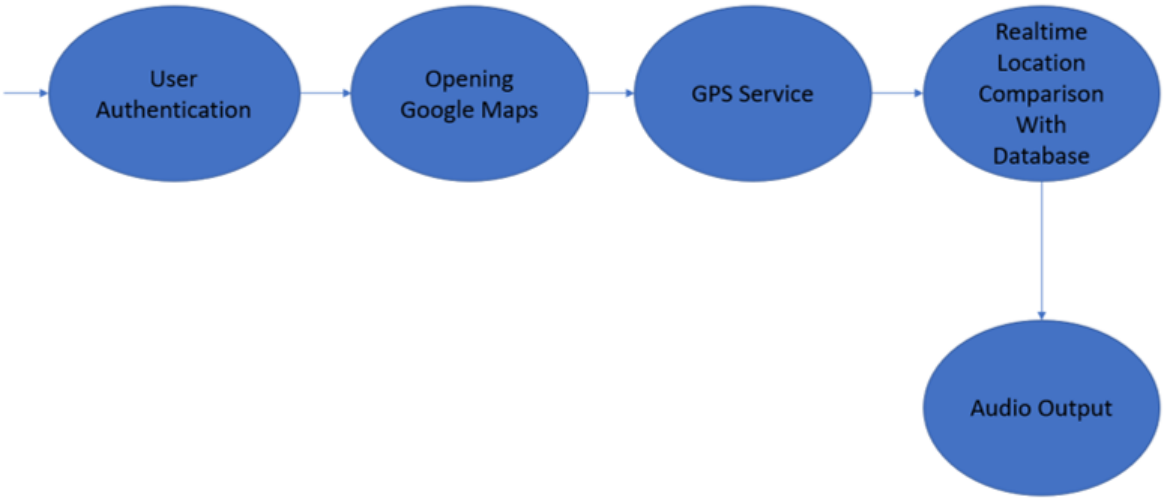

Figure 3.2: Data Flow Diagram

User Authentication:- [4] Email authentication, or validation, is a collection of techniques aimed at providing verifiable information about the origin of email messages by validating the identities of any message transfer agents (MTA) who participated in transferring and possibly modifying a message.

Most of the apps need to know the identity of the user before providing the access to the app for a better security of the user's daa over cloud and provide the same personalized experience across all the users in the world. To sign in an app can use the mobile number or the e-mail and password of the user. Then, the app pass these credentials to the Firebase Authentication SDK. Firebase Firestore backend services will then verify those credentials and return a response to the client.

After a successful sign in, the app can access the user's basic profile information, and the app can control the user's access to data stored in other Firebase products.

Opening Google Maps:- [5] Google Maps is a web mapping service developed by Google. It offers satellite imagery, aerial photography, street maps, 360° panoramic views of streets (Street View), real-time traffic conditions, and route planning for traveling by foot, car, bicycle and air (in beta), or public transportation.
When a user opens the map for the service, the app will first check whether the user have given permission for Coarse Location, Fine Location and GPS service provider, if the permission has not been given the app will prompt to give these permissions and then a map will appear on the screen with a blue dot which represents the user' current location.

GPS Service:- The Global Positioning System (GPS), originally Navstar GPS, is a satellite-based radionavigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. Obstacles such as mountains and buildings block the relatively weak GPS signals.

The GPS does not require the user to transmit any data, and it can be operated without any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information. The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States

government created the system, maintains it, and makes it freely accessible to anyone with a GPS receiver.

The GPS Service in this app runs continuously to get the real-time location update and move the marker with the change in position of the user. The Location of the user is then checked with the database, if the user is near a particular position stored in the database, the application start to describe that place through voice assistant.

Realtime Location Comparision with Database:- The Current Location of the user is checked with the database after every specific time interval and if the user is near a particular area stored in the database, the app retrieve all the details stored in the database about that position and will start speaking. if the position of the user is not near any point stored in the database, the app will not speak.

Audio Output:- [6] The Application uses Google Text to Speech Library Software for the app to speak the details of a location. Google Text-to-Speech is a screen reader application developed by Google for its Android operating system. It powers applications to read aloud (speak) the text on the screen which support many languages. Text-to-Speech may be used by apps such as Google Play Books for reading books aloud, by Google Translate for reading aloud translations providing useful insight to the pronunciation of words, by Google Talkback and other spoken feedback accessibility-based applications, as well as by third-party apps. Users must install voice data for each language. If the user is near a particular area stored in the database, the app retrieve all the details stored in the database about that position and will start speaking through Text to Speech Library.

3.3 Physical design

3.3.1 Input requirement

The input to the app is the user details and his/her real time location through GPS service of an android device.

3.3.2 Output requirements

The app will give the output in the form of voice assistant based on the user real-time location. The output is shown in Appendix A.

3.3.3 Storage requirements

The Database is used to store User details and Location Description. The database used is Firebase Firestore which is one of the Document-Oriented database and most of its features are open source. The database will consist of 3 collections. The Users collection will store the user details who sign up to the app and will create a seperate document for each user. The User Location Collection will store and keep updating the real time Geopoint of the users who are currently signed in the app. The Location_Description Collection will store different documents and each document corresponds to the geopoint and its description, which the voice assistant will speak.

3.3.4 Processing requirements

This Application will run on any android device with Android API Level 21 (Android Lollipop) and above with any basic processor like Mediatek MT-6589 processor or above.

3.4 Summary

This chapter explains the Analysis done and the Architectural Design of the application. The Tourism Sector is the ever increasing sector for any country and this app can work as a virtual guide at any tourist place.This application is the indoor guide application which works inside and near a Famous/Historical place/Monument. This Application uses realtime user location to check whether the user is standing or walking near a point of historical importance inside a famous/Historical Place and through voice assistant, tells the user all the Details about that place. This application will allow the blind person to go out and explore the world more independently.

Chapter 4

Implementation and Testing

Outline: This chapter presents the following:

1. Technology Stack
2. Coding Structure
3. Testing

4.1 Technology Stack

4.1.1 Firebase Firestore:-

Cloud Firestore is the database for mobile, web and server development. It keeps the data of the app sync across all client apps and all platforms It also supports offline mode for mobile and web so we can build responsive apps that can work in the areas where there is poor or no internet connectivity. It is based on NoSQL data model, where data is stored in hierarchical document-oriented structure.
In the Firestore Database mGuode Android App stores the user Information like his/her e-mail id, password, username, Real-Time Location. It also stores Geopoints of the area and the description associated with each geopoint which is spoken by the voice assistant.

4.1.2 Android Studio:-

Android Studio IDE is used to create this app. It is built on JetBrains'IntelliJ IDEA software and designed specifically for Android Development.
Android Studio provide the best feature and support among all other android development softwares currently available.

In the mGuide Android Application, Android Studio was used to create U.I. design using XML and Java Programming Language is used for coding and connecting the application to the Firestore database.

4.1.3 Java:-

Java is an object oriented Programming Language which let application developers to write platform independant codes. Java applications can be compiled to "Bytecode" that can run on any Java Virtual Machine(JVM) regardless of computer architecture.

Java Programming Language is used in this application for building and imple-

mentating the logic and to assure code re-usability in the app. It connects the user Interface to the Database effectively and allows the user to interact with the app in fast and efficient manner.

4.1.4 Google Maps API:-

With the Maps SDK for Android, you can add maps based on Google Maps data to your application. The API automatically handles access to Google Maps servers, data downloading, map display, and response to map gestures. You can also use API calls to add markers, polygons, and overlays to a basic map, and to change the user's view of a particular map area. These objects provide additional information for map locations, and allow user interaction with the map. The API allows you to add these graphics to a map:

- Icons anchored to specific positions on the map (Markers).
- Sets of line segments (Polylines).
- Bitmap graphics anchored to specific positions on the map (Ground Overlays).
- Sets of images which are displayed on top of the base map tiles (Tile Overlays).

4.2 Coding Structure

There are some challenges faced by the developer while implementing the software. Some of them are mentioned below:
Code-reuse Programming interfaces of present-day languages are very sophisticated and are equipped huge library functions. Still, to bring the cost down of end product, the developer prefers to re-use the code, which was created earlier for some other software.

4.2.1 For Registering the user

firebaseAuth.createUserWithEmailAndPassword(_email, password). addOnCompleteListener(new OnCompleteListener<AuthResult>()) is used to register the user details like

name, mobile number, e-mail, password in firestore database.

4.2.2 For login and Authentication of the user

firebaseAuth.signInWithEmailAndPassword(email, pass).addOnCompleteListener(new OnCompleteListener<AuthResult>()) is used for sign in and authentication of the user through database connection.

4.2.3 For getting Location Permission, Initializing map & Starting Real-time Location Service

public boolean isMapsEnabled(), private void getLocationPermission() & private void buildAlertMessageNoGps() are the functions used for getting location permission and checking whether the GPS of the device is on or off.
private void initMap() is used to initilize the map after getting all the required permissions from the user.
private void startLocationService() is used to start the real-time location service.

4.2.4 Code for Starting GPS Service Update and accessing data from the database

private void getLocation() function runs after every specific time interval and get the position of the user at that time and if the user is standing/walking from a place of interest the app starts speaking through mTTS.speak(description,TextToSpeech.QUEUE_FLUSH,null,null) function.
private void saveUserLocation(final UserLocation userLocation) is used to store the current position of the user in the database.

4.3 Testing

The testing phase of the software development lifecycle (SDLC) is where you focus on investigation and discovery. During the testing phase, developers find out whether their code and programming work according to customer requirements. And while it is not possible to solve all the failures you might find during the testing phase, it is possible to use the results from this phase to reduce the number of errors within the software program.

Manual Testing is the process of testing the software manually to find the defects. Tester should have the perspective of end users and to ensure all the features ar working as mentioned in the required document. No Automation tools are used in manual testing

This App was tested manually multiple times by multiple users at the Boys'hostel Arena of IIIT Manipur and the app work correctly 95% of the time. During testing the user passes through various different points at IIIT Manipur Boys'hostel and the app responded correctly & accordingly. It was observed that if the user have a strong and fast internet connection, the app worked correctly 100% of the time. The optput of which is shown in Appendix A.

Chapter 5

Conclusion

mGuide Android Application is the world's first of its kind app. The Technology Stack and algorithm, which were implemented in this project, were chosen after extensive research, and the successful testing results confirm that the choices made by the researcher were reliable. This app can be used by the people all over the world when it will release after adding support for at least 100 Places or Monuments and they can experience the whole new system for guidance at tourist places for free!. This app will be a boon for Blind and Deaf people who want to live and roam around the world independently.
Therefore, through this app tourists can explore many different places more independently with accurate description of that place. This app can boost the tourism sector of any country and will give the power of technology to every single person in the world

and make the world a better place to live in.

5.1 Future direction

Currently this app support the guidance for IIIT Manipur Boys' Hostel. This app can be expanded to other historical/famous monuments/places and the User Interface could be improved by using more android architectural components so that the speed of the app should increase and become efficient.

Appendix A

Screenshot and Description of the Implemented System

A.1 Login Form

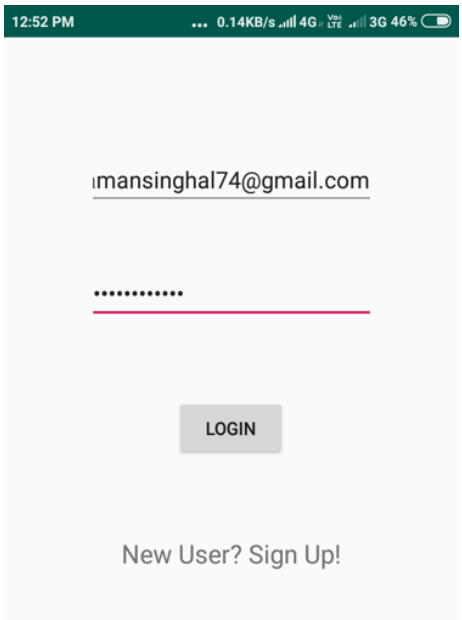

Figure A.1: Login Activity

Figure A.1 The figure shows the screen where user logs in after signup.

A.2 Registration Form

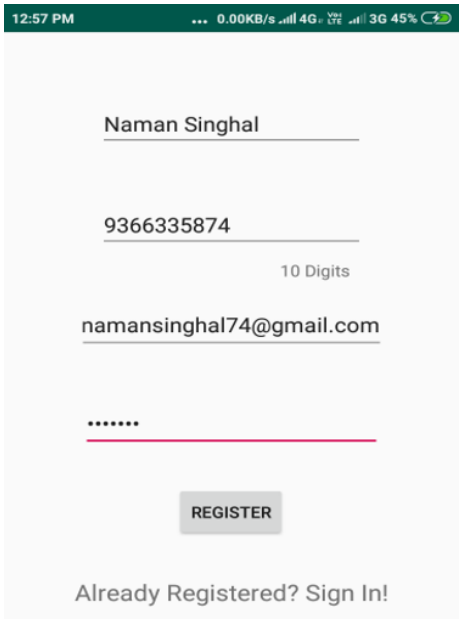

Figure A.2: Registration Activity

Figure A.2 The figure shows the screen where user register himself/herself.

A.3 Menu

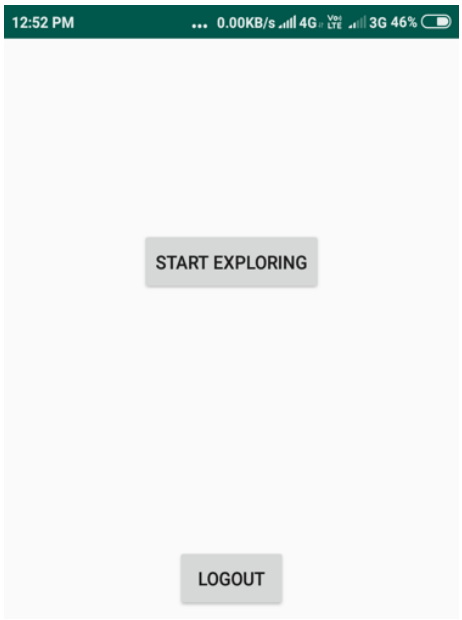

Figure A.3: Menu Activity

Figure A.3 The figure shows the screen where the user can start exploring or log out.

A.4 Hostel Entrance

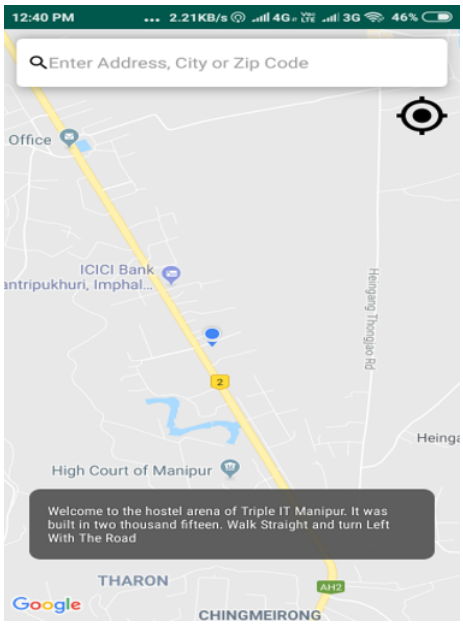

Figure A.4: Text at Enterance in the hostel

Figure A.4 The figure shows the screen when the user enters the hostel. The app also speaks the Text written in the figure A.4

A.5 HB-I

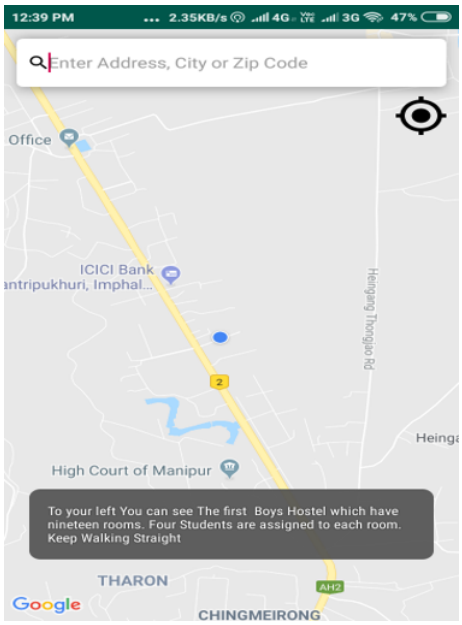

Figure A.5: Text at HB-I Hostel

Figure A.5 The figure shows the screen when the user is walking or standing in front of the HB-I Boys' Hostel. The app also speaks the Text written in the figure A.5

A.6 HB-II and Mess

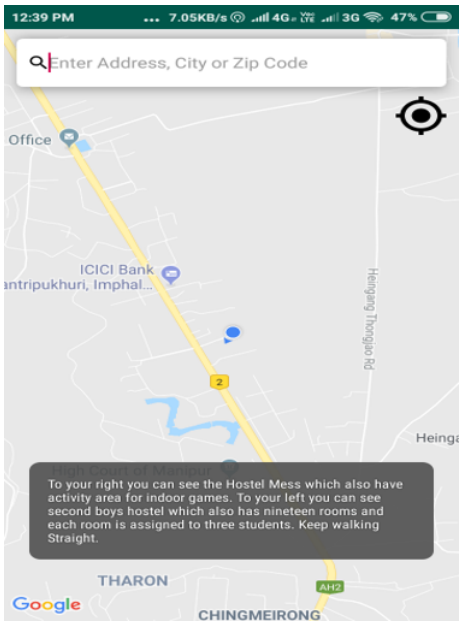

Figure A.6: Text at HB-II and Mess

Figure A.6 The figure shows the screen when the user is walking or standing in front of the HB-II Boys' Hostel and mess. The app also speaks the Text written in the figure A.6

A.7 HB-III

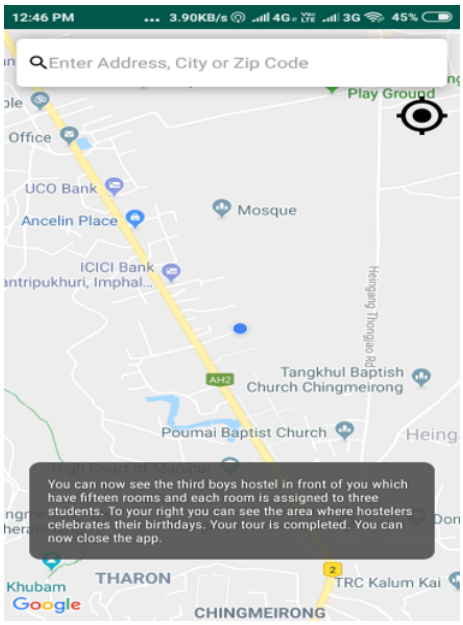

Figure A.7: Text at HB-III Hostel

Figure A.7 The figure shows the screen when the user is walking or standing in front of the HB-III Boys' Hostel. The app also speaks the Text written in the figure A.7

Appendix B

User manual

B.1 Step to install your implemented system

Prerequisites:-

1. You must be having an Android Device.
2. Should have API level 21 or above(Android Version: Lollipop or Above).

Installation:-

3. Open mGuide -> app -> release.
4. Allow 3rd party apps to install in your device in the settings menu.
5. Copy and Install app-release.apk to your android device.
6. App will be installed by the name mGuide.
7. Open the App and Signup.

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