

ROUTE TURN AND HURDLE GUIDANCE APP



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DEDICATION

I want to dedicate this project to my parents who supported me in hard times and motivated me to reach this level of my life. I will always be in debt of your greatness.

Muhammad Farjad Ali Raza

DECLARATION

It is declared that this is an original piece of my own work, except where otherwise acknowledged in text and references. This work has not been submitted in any form for another degree or diploma at any university or other institution for tertiary education and shall not be submitted by us in future for obtaining any degree from this or any other University or Institution.

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March 2019

CERTIFICATE OF APPROVAL

It is certified that the project titled “Route Turn and Hurdle Guidance App” carried out by Muhammad Farjad Ali Raza, Reg. No. SEU-S15-113 under the supervision of Mr. Arshad Ali Khan, The University of Lahore, Islamabad, is fully adequate, in scope and in quality, as a final year project for the degree of BS of Software Engineering.

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I offer my thanks to **HOLY PROPHET MUHAMMAD ﷺ (PBUH)** from the deepest core of my heart, who is forever a torch of guidance and a paved path of knowledge for humanity as a whole. Allah have not sent any messenger, but that he should be obeyed by Allah’s will, and if when they do injustice unto their souls, then O beloved! They should come to you and then beg forgiveness of Allah and the messenger should intercede for them then surely, they would find Allah Most Relenting, Merciful.

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ABSTRACT

Speed kills and the speed breaker also. Pot Holes and badly designed speed breaker not just irritate drivers they cause slowness in traffic flow. Issue is that whenever a person or a driver goes to a location and has no information about the road condition like if there is a speed breaker or pothole on the road, drivers often cannot recognize the appearance of unmarked speed breakers and lose control of the vehicle that can be cause of injury or death. To avoid and reduce such type of road accidents, I have developed an android app Route Turn and Hurdle Guidance App which has two separate applications one for collecting data of hurdles and the other for using that data and notifying the user from appropriate distance to slow down the speed. RT&H Training application uses accelerometer sensor and GPS location of the device to get the intensity and the location of the hurdle and sends the data to database. The client-side application reads the data from database and keeps measuring distance from device current location to all the hurdle GPS location points detected. The purpose of RT&H Guidance app is to inform the user to avoid any kind of misadventure that can cause injury or death. The RT&H Guidance app uses built-in sensor of android devices like Accelerometer and GPS that make it cost effective. However, we can use external GPS and Accelerometer by using Arduino device, which uses wireless signal to send data mounted on or inside vehicle. In literature, there exist a few methods to warn on-road drivers about the upcoming speed breakers or potholes, which are highly error-prone and time consuming. I have come forward with an application that facilitates autonomous speed breaker or pothole data collection, dynamic speed breaker detection and warning generation for the on-road drivers. This application also incorporates real-time tracking of driver and vehicle.

TABLE OF CONTENTS

DEDICATION	III
DECLARATION	IV
CERTIFICATE OF APPROVAL.....	V
ACKNOWLEDGMENT.....	VI
ABSTRACT.....	VII
LIST OF TABLES.....	X
LIST OF FIGURES	XI
CHAPTER 1	1
INTRODUCTION	1
TYPES OF ROAD BUMPS	1
1.1 OVERVIEW	2
1.2 PROBLEM STATEMENT	3
1.3 PURPOSE OF THE PROJECT	3
1.4 COMPARISON AMONG EXISTING TECHNIQUES.....	3
1.5 TOOLS AND TECHNIQUES	4
1.6 WORKING PLAN	4
1.7 SUMMARY	5
CHAPTER 2	6
LITERATURE REVIEW.....	6
2.1 TECHNOLOGY	6
2.2 RELATED TECHNOLOGIES	6
2.3 RELATED TECHNOLOGY 1	6
2.4 RELATED TECHNOLOGY 2	7
2.5 THEIR LIMITATIONS AND BOTTLENECKS	9
2.6 SUMMARY	9
CHAPTER 3	10
TOOLS AND TECHNIQUES	10
3.1 HARDWARE USED WITH TECHNICAL SPECIFICATIONS	10
3.2 SOFTWARE USED WITH TECHNICAL SPECIFICATIONS.....	11
3.3 SOFTWARE(S), SIMULATION TOOL(S) USED	12
3.4 SUMMARY	12
CHAPTER 4	13
METHODOLOGIES	13

4.1 DESIGN OF THE INVESTIGATION/ALGORITHMS/HARDWARE...	13
4.2 IMPLEMENTATION PROCEDURE	14
4.3 VERIFICATIONS OF FUNCTIONALITIES	31
4.4 SUMMARY	33
CHAPTER 5	34
SYSTEM TESTING	34
5.1 OBJECTIVE TESTING.....	34
5.2 USABILITY TEST	35
5.3 SOFTWARE PERFORMANCE TEST	35
5.4 COMPATIBILITY TESTING.....	36
5.5 LOAD TESTING.....	36
5.6 SECURITY TESTING	37
5.7 INSTALLATION TESTING.....	37
5.8 USER CASES.....	38
CHAPTER 6	39
RESULTS AND CONSLUSIONS	39
6.1 PRESENTATIONS OF THE FINDINGS.....	39
6.1.2 MAIN ACTIVITY	40
6.1.4 SEARCH ACTIVITY	41
6.1.5 MAP STYLES	41
6.2 DATA COLLECTION APP	42
6.3 DISCUSSIONS OF THE FINDINGS	42
6.4 RECOMMENDATIONS.....	43
6.5 SUMMARY	43
6.6 CONCLUSIONS.....	43
CHAPTER 7	44
FUTURE WORK.....	44
REFERENCES	45
APPENDICES	47
APPENDIX A	47

LIST OF TABLES

TABLE 1 EXECUTIONS OF ACCELEROMETER	17
TABLE 2 COST COMPARISON GOOGLE VS MAP	27
TABLE 3 USER TEST CASE 1	38
TABLE 4 USER TEST CASE 2	38

LIST OF FIGURES

FIGURE 1 PAINTED SPEED BREAKER	1
FIGURE 2 ROAD BUMP	2
FIGURE 3 POTHOLE	2
FIGURE 4 WORKING PLAN SEQUENCE FLOW	4
FIGURE 5 MANUAL DETECTION FLOW CHART	7
FIGURE 6 USING TECHNIQUE FLOW	8
FIGURE 7 ACCELEROMETER SENSOR.....	10
FIGURE 8 NANO GPS SENSOR	11
FIGURE 9 ANDROID VIRTUAL DEVICE.....	12
FIGURE 10 SEQUENCE DIAGRAM	13
FIGURE 11 SENSORS UTILIZATION	14
FIGURE 12 LEVEL 1 ACTIVITY	14
FIGURE 13 LEVEL 2 ACTIVITY	15
FIGURE 14 USER INTERFACE RTH GUIDANCE	19
FIGURE 15 MEMORY MONITOR SCREEN	20
FIGURE 16 FIREBASE REAL-TIME DATABASE MENU	22
FIGURE 17 ADDING DATA INTO JSON	23
FIGURE 18 RECEIVED RESPONSE IN JSON.....	23
FIGURE 19 FIREBASE DESCRIPTION.....	25
FIGURE 20 MAPS COMPARISON.....	26
FIGURE 21 MAP UPDATION OF LOCATION	28
FIGURE 22 APPLICATIONS OF MQTT	30
FIGURE 23 USER ACTIVITY GUI	32
FIGURE 24 USER END GUI	35
FIGURE 25 LOGIN GUI.....	39
FIGURE 26 MAIN ACTIVITY OF RTHGA	40
FIGURE 27 TURN BY TURN ACTIVITY	40
FIGURE 28 SEARCH ACTIVITY.....	41
FIGURE 29 MAP STYLES.....	41
FIGURE 30 DATA COLLECTION APP	42

Chapter 1

INTRODUCTION

The detection of paved surface anomalies (potholes, speed bumps) and their correct localization contribute to the development of driver's safety and to the optimization of road maintenance operations. Road quality assessment has been known as a vital issue associated with the likelihood of creating the transportation additional safe, efficient and cozy. This can be the one among the reasons that obstacle recognition assumes a significant job in security safety and luxury for all road users. The reduction in average conveyance speed considerably improves the security of individuals within the neighboring areas. Even if there's proof that speed-breakers scale back speed connected accidents, they have conjointly been proverbial to cause accidents and injuries. This application is predicated on mapping and navigation that detects and provides info concerning the road anomalies e.g. turns, speed breakers etc. and can facilitate in hindrance of road accident.

Types of road bumps

following types of road bumps exists which can really be destructive and can cause severe accidents.



Figure 1 Painted Speed Breaker

(Figure 1 shows speed breaker or a speed bump painted on the road).



Figure 3 Pothole

(Figure 3 shows a pothole at road filled with dirt and water).



Figure 2 Road Bump

(Figure 2 shows a road bump at the side of a road).

1.1 Overview

The system relies on automaton application that has been developed to assemble info on road quality with the final word aim of giving time period information to road users, allow them to possess a map and GPS (receiver to urge location data of the road) with complete guidance of turns and hurdles. The system is for certain to gather analysis info mistreatment several different types of vehicles (i.e., car, motorcycle, bus, cycle-rickshaw, and automobile rickshaw) driven by utterly totally different people on

various different roads. Throughout this approach each event is placed and it's realizable to make an information set of road anomalies by means that of a central server to that data collected by users is reported and registered. MQTT is that the essential component of our system for the storage of all the detector info, that gives options gives a capability to store collected info offline. Stakeholders are keen to develop a road detection system supported the use of automaton mobile devices, driving a check vehicle and a utilitarian automotive for the validation method.

1.2 Problem Statement

Human-made oddities, like speed bumps, don't seem to be forever properly labeled, can cause accidents when not known by the drivers. The driver might fail to note the speed bumps in complicated driving conditions particularly throughout nights or in the foggy weather due to low visibility, which ends into serious harm.

1.3 Purpose of the Project

The resolution of this application is to note and provide information regarding road abnormalities (i.e., speed bumps, sharp turns) on robot platform. This method makes use of a tool mounted in Associate in Nursing automotive a GPS receiver to urge location information of the road. Once having the vehicle trip through several locations, data is retrieved from the sensors transfer this knowledge on server therefore every client can utilize this data throughout travel. This app is a supply of steering for new drivers that are non-familiar to new location and helps in previous inform the user regarding speed breaker and a sharp curve.

Main Objectives can be written in points as below:

- Speed kills and the speed breaker also
- Avoid road accidents and injuries
- Notification of the speed breaker
- Location Tracking of the user
- Secure
- User friendly and informative

1.4 Comparison among existing Techniques

In the existing system, it was very difficult to identify the road Bumps & in order to avoid accidents. It was compatible with few devices and it has no detection by any

sensor. Whilst, *RTHGA* will earlier notify user before a speed breaker and a sharp curve. It will help in prevention of road accident. Source of guidance for new drivers which are non-familiar to new location.

1.5 Tools and Techniques

- Accelerometer reading of z axis
- Android Studio
- Google Firebase Database
- Map box and Google map API

1.6 Working Plan

There were significant technical difficulties in developing an app, this will be a risk because group has very little involvement with the pertinent instruments and innovations in spite of the fact that we will learn, and we will unquestionably commit some error and imperfect decisions. We will address this hazard by perusing the venture with the end goal that we have sufficient opportunity to prepare and to survey the structure and execution. However, we made the working plan of project and divided the steps taken during the final prototyping and execution of the project. The flow diagram of working plan will be lighting the progress step wise throughout the final year.

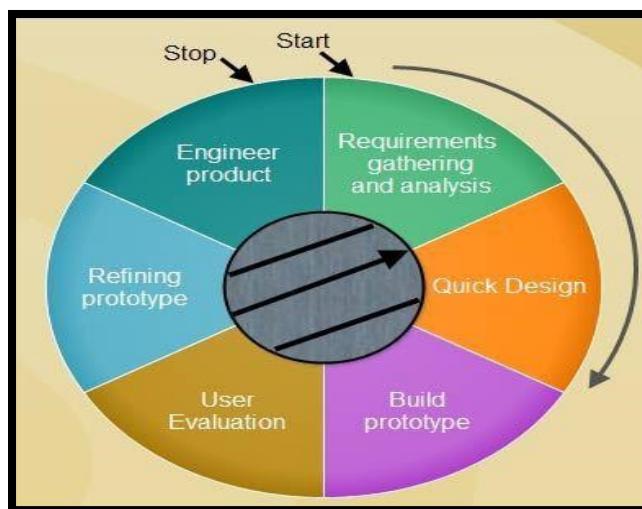


Figure 4 Working Plan Sequence Flow

(Figure 4 shows the working plan to develop the application).

The whole working plan is divided into eight steps which were supposed to be completed half in seventh and remaining in the final semester. To develop an

application every single step in working arrangement must be pursued and ought to be actualized with extraordinary consideration generally the result won't be same.

Objectives to be completed in seventh semester were as follows:

- Problem Identification
- Solution Proposal
- SRS Document
- Proposal Presentation

Whilst, our final semester's objectives are given below.

- Design Based Implementation
- Testing/ Validation
- Project Report
- Final Presentation

1.7 Summary

Introduction of the report contains problem statement, its objectives, scope, techniques and tools used and working plan throughout the final year. It will help reader to understand our working approaches and a brief summary of our purpose of getting into development of this android based application. Working plan contains the life cycle of development of the application. App detects and notifies about the speed breakers and pot holes using accelerometer. App utilizes API's to measure the distance from the point where user is standing to the point where the speed breaker is and if distance is less than 1000 meter it notifies the user. Application uses MQTT to be able to be accessed with internet which gives users an interrupted access to the application with user-friendly environment.

Chapter 2

LITERATURE REVIEW

In this section, we will discuss the background study before starting the project's main core. The purpose of the study and the course of study what we did for understanding the methodology from the specific articles, books and internet sources.

2.1 Technology

Our project is based on Android Mobile application. The application is based on mapping and navigation. It detects and provides information about the road e.g. turns, speed breakers etc. Our application will help in prevention of road accident. The Route turns and hurdle guidance app is a new self-contained app intended for use on the android platform. While “Route turns and hurdle guidance” mobile application is the main focus of the project, there is also a server-side component which will be responsible for database which controls the GPS and all route information. The application runs on Android Operating System and it is implemented on API, which supports Java scripting language. This development tool is preferred because it is a best application developing engine. It is portable and cross platform which means that the same code, developed via API, can be ported on many platforms with minimal modifications.

2.2 Related Technologies

There are existing applications which help the driver to explore the course yet these applications help us to explore just the course to achieve wanted goals. The street surface and its smoothness for the protected and dependable drive is must. There is should be refreshed about the street conditions. The street administration life is remembered while making cleared surfaces as per the limit of traffic and conveying vehicles.

2.3 Related Technology 1

Road Surface monitoring is carrying out manually by employing persons for specific purpose solely. they're accustomed monitor and find the potholes or the other irregularity and report back to the regarding department. This manual approach of watching and change is slow and costs high because the salaries of utilized persons and alternative expenses. Department has got to create specific budget for this purpose than

for the road repairing moreover. So, this method is recent and not prompted. Another approach is thru volunteer drivers that find and report the road conditions and abnormalities to the municipality or involved department however, this is often additionally slow method as 1st the motive force can observe than he'll report and then on will the reaction or operation of repairing will begin. we want to own a quick, effective and reliable means that to try and do prompted action.

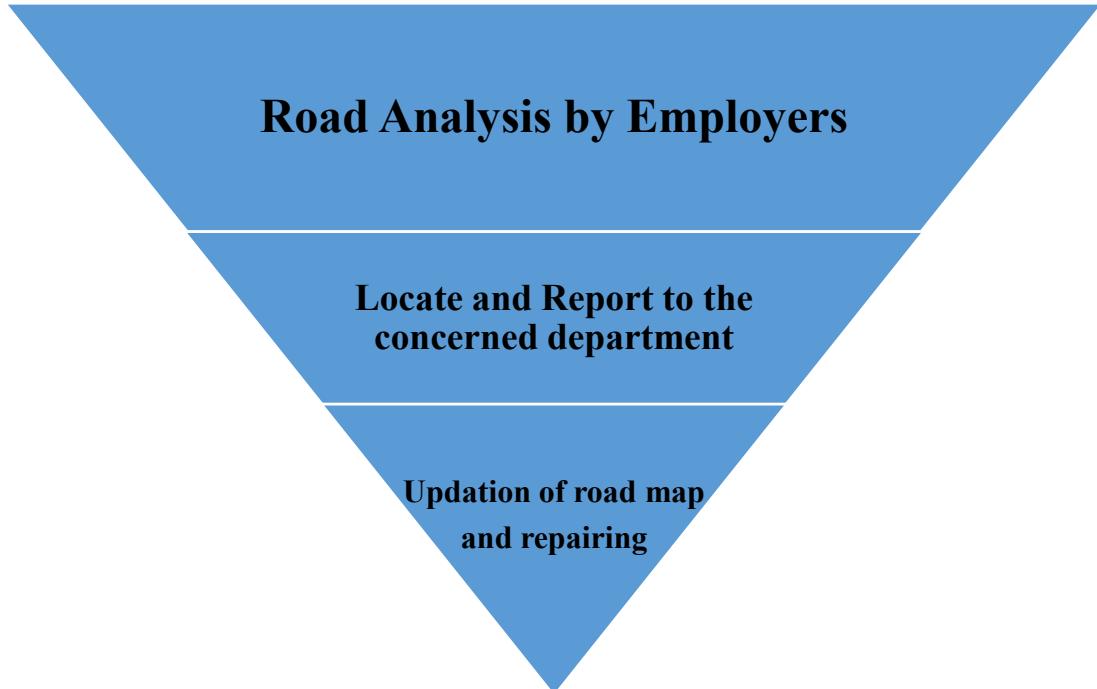


Figure 5 Manual Detection Flow Chart

(Figure 5 shows all the manual data gathering flow chart that are required).

2.4 Related Technology 2

Alternative to the above-mentioned approaches is automatic detection of potholes. This approach has two different systems as responsive and unresponsive. Former makes system using optical and aural sensors. Special vehicles would have to be engaged because these devices have to be installed so the condition of road is clearly observable. Later one makes system using inertial sensors like accelerometer and gyroscope to access and analyze the abnormalities. These sensors include the 3-axis accelerometer study and understanding for locating potholes. These sensors are trained with GPS as to give coordinates of road surface which is to be monitored and repaired. External sensors are also used for vehicle tracking and monitoring. By using camera with image processing and machine learning techniques application can be made intelligent.

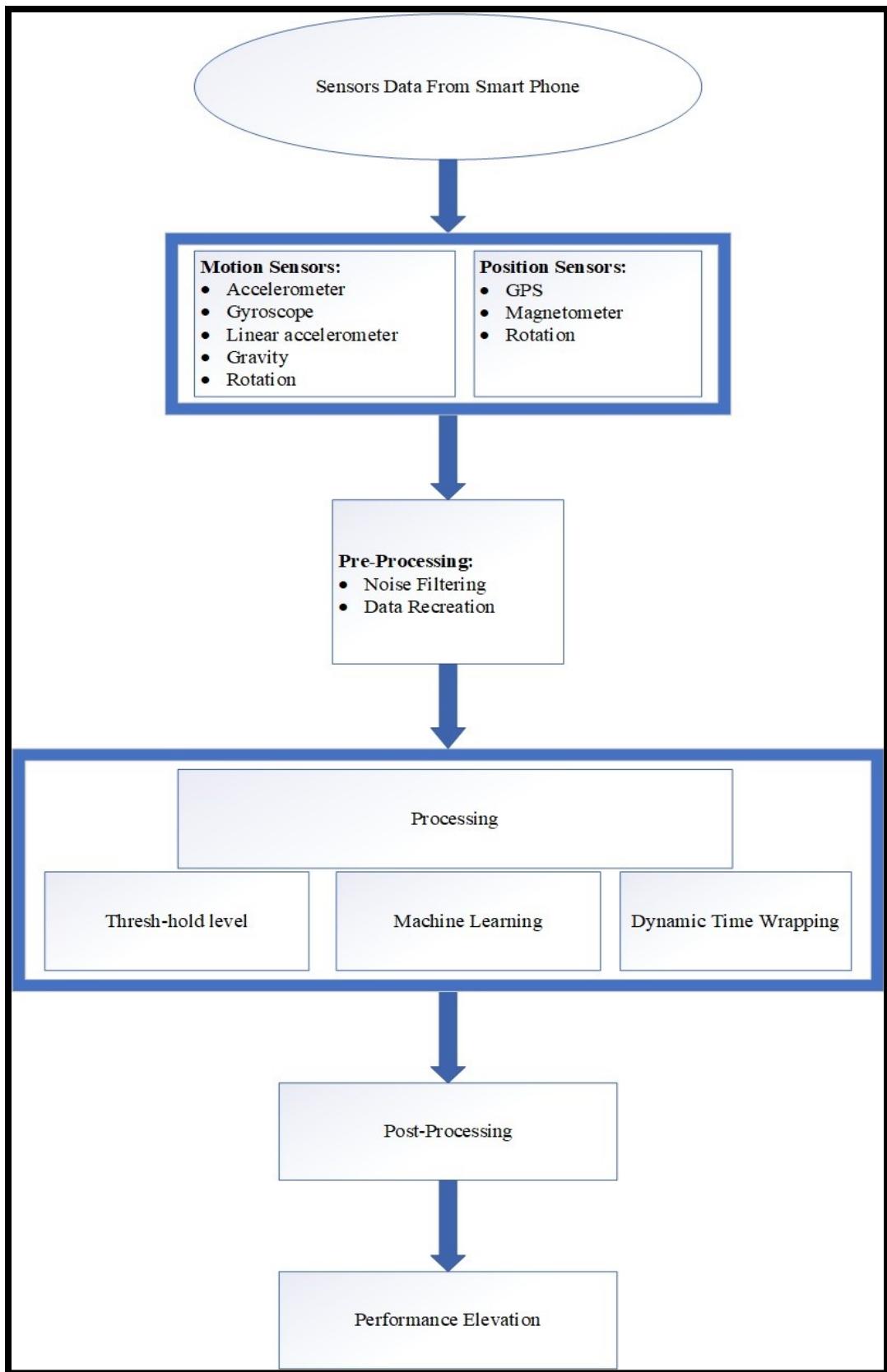


Figure 6 Using Technique Flow

(Figure 6 shows that data gathering technique from the sensors).

2.5 Their Limitations and Bottlenecks

Technologies existing and discussed above are considered as out of date as these techniques are slower and costly. First one needs proper infrastructure and department for managing man power and their budgeting issues and this is slower as to be operated manually or the volunteer drivers used to observe and report about abnormalities of road to the concerned highway department for repairing and encountering smooth traffic flow. These approaches are slower and costly.

Secondly, using optical and aural sensor needs complex algorithms to detect potholes. The major drawback is that it has not the functionality for real time data progression.

At the bus stations through wireless network data is collected and stored locally to acquire nodes. Acceleration based sensing is used to detect potholes in algorithm.

We need to make it real time data processing and collectively working with inertial sensors like accelerometer and gyroscope with understanding 3-axis to detect the exact potholes and hurdles and to be update with real time communication through data training. Once the abnormality is detecting there is need to be update as soon as possible on given map for the ease of coming drivers to avoid the hurdles. This will work with GPS sensors and accelerometer, passes data to different data classifiers to mine the particular irregularity information.

2.6 Summary

Literature review includes the previous studies regarding potholes detection and the techniques to be adopt for the solutions to avoid and repair the road surfaces for the traffic smoothness. Technologies working and their drawbacks where they lack and why we need to do additional working. The slower processes and how to make it fast and reliable and to be monitored in real time for the prompt action. Research papers and related studies can be used to develop application to monitor road condition and repair the roads.

Chapter 3

TOOLS AND TECHNIQUES

Application we are trying to develop runs on Android operating system and it is implemented on API, which supports Java scripting language. This development tool is prioritized because it is a top application development engine. It is transferable and cross platform which means that the same code which is developed on API can be ported on many platforms with slight adaptations.

3.1 Hardware used with Technical specifications

Since the application relies on android, thus it supports any android System, meeting the subsequent criteria:

- a minimum of 1GB ram and 100MB memory storage to install and load the applying.
- bit screen input for choosing choices from menus and capture the image.
- A local area network connection to transfer and install the applying.

The product shall be supported Android and should run from the android device. The merchandise shall take initial load time counting on web association strength that additionally depends on the media from which the product is run. The performance shall depend on hardware parts of the user.

3.1.1 Accelerometer

Version: ADXL345

Manufacturer: SparkFun.

Power Required: 2.5 V.

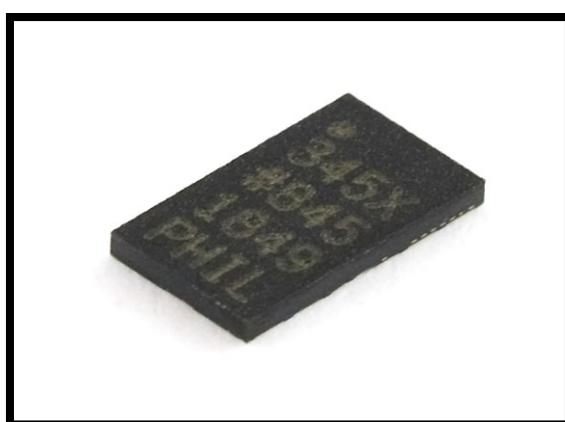


Figure 7 Accelerometer Sensor

3.1.2 GPS

Version: ORG1411-PM04

Manufacturer: OriginGPS

Power Required: 2.0 ~ 5.5V

Power Consumption: 11 mW (Tracking)

Accuracy: 2.5 meter



Figure 8 Nano GPS sensor

3.1.3 Back End internal Computers

The framework will give storage of all databases on excess PCs with programmed switchover. The framework will accommodate replication of database to off-site storage areas.

3.1.4 Internet Service Provider

The framework will give an authoritative understanding a network access supplier for T3 access with 99.99% accessibility. The framework will give an authoritative understanding a web access supplier who can give 99.99% accessibility through their system offices onto the web.

3.2 Software used with Technical specifications

- **PHP** - A server scripting language used by “*ROUTE TURNS AND HURDLE GUIDANCE APP*”.
- **Android Studio**- A platform for developing android app.
- **Accelerometer** reading of z axis
- **Google Firebase Database**
- **Map box and Google map API's**

3.3 Software(s), simulation tool(s) used

The platforms used for development of the application and simulation are:

- **Android Emulator**

Android Emulator uses android virtual device to simulate android devices to run and test application during development.

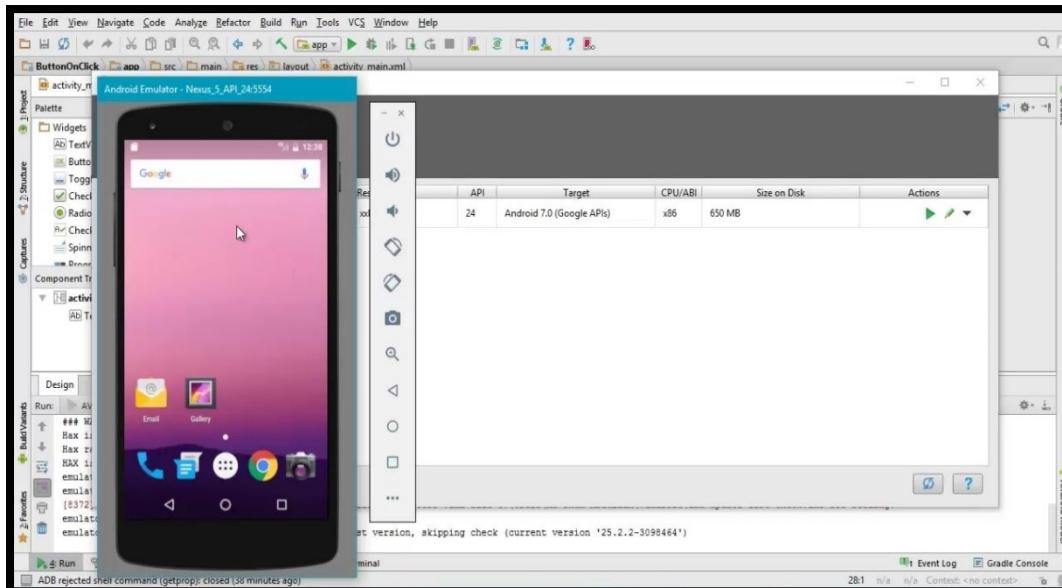


Figure 9 Android Virtual Device

(Figure 9 show a virtual android device running in the android studio to stimulate the application).

3.4 Summary

Tools and the hardware requirements we need to develop this app are discussed in this chapter as well as software platforms used to develop the app and database. Application uses the GPS coordinates reading and accelerometer reading to measure and mark the place speed breaker or pot hole. It then stores the data into Firebase database of its coordinates and the intensity of z-axis of accelerometer. User side app reads those coordinates and marks the location on map and then starts measuring distance from each of coordinates.

Chapter 4

METHODOLOGIES

The main working and the progress throughout will be discussed here. We are going to describe the initial step, models, their working and the background activities of the *RTHGA* which will clear the with the methodology's description.

4.1 Design of the investigation/Algorithms/Hardware

Before reaching the final prototyping in a project or a designing of an app there is a need of series of study and trainings.

The following steps are taken in the design process.

Sequence Diagram

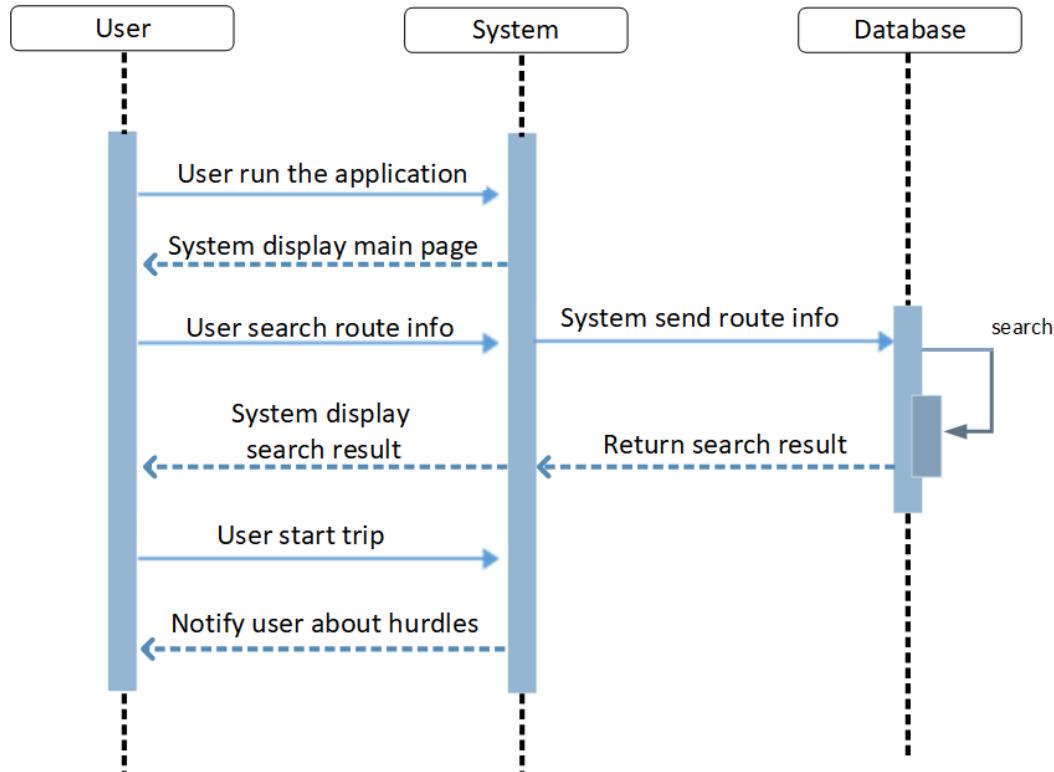


Figure 10 Sequence Diagram

(Figure 10 shows the interaction between user and system).

A sequence diagram basically portrays communication between activities in a consecutive request for example the request wherein these associations occur. We can likewise utilize the terms occasion outlines or occasion situations to allude to a grouping graph. The grouping chart demonstrates the well-ordered connection and information trade between interfaces.

Sensors we are utilizing

There are the following types of sensors we are going to utilize in our system.

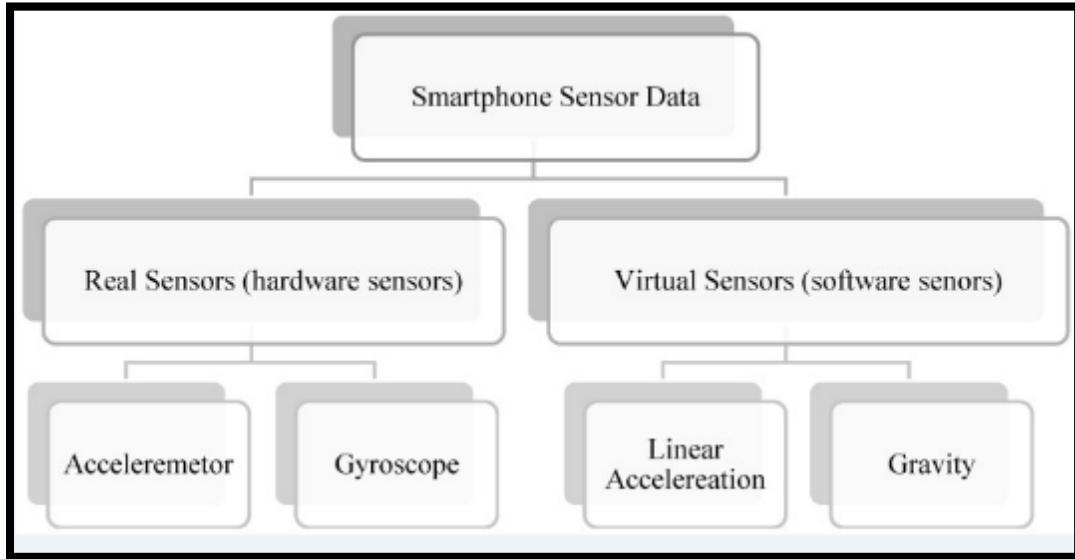


Figure 11 Sensors Utilization

(Figure 11 shows sensors are utilization).

4.2 Implementation Procedure

The end to end activity procedure given below describes the processes going on throughout. The user just logs in and search the routes this step is carried out through MySQL query technique. The system reports to the database API/ Google API to investigate and returns with the information regarding available routes. This activity is described by the diagram as follows.

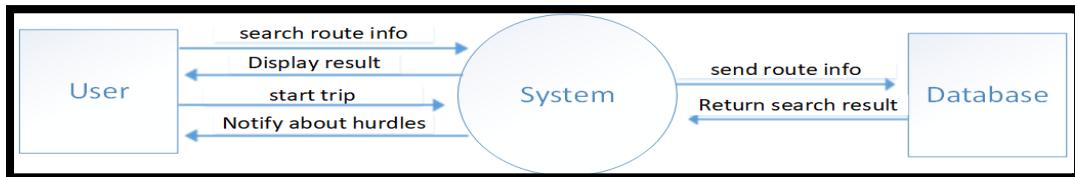


Figure 12 Level 1 Activity

(Figure 12 shows the outer view of application working).

Activity Diagrams portray how exercises are composed to give an administration which can be at various dimensions of reflection. In the wake of getting data about courses client chooses the ideal location and begins trip. The chosen location is trailed by the client and excursion begins. Framework gathers the data structure database and tells the client about obstacles. The database fills in as center for all the data of the obstacles and the client communicates with database just through application.

This activity is shown in figure given below.

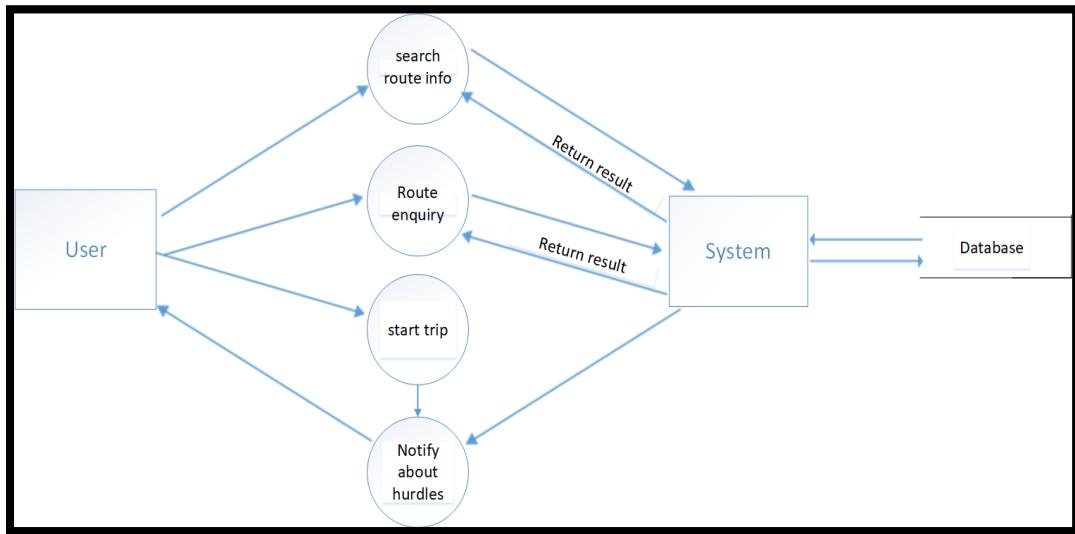


Figure 13 Level 2 Activity

(Figure 13 shows detailed activities of user with system).

This is the implantation procedure of app user to be notify about road hurdles. This process helps the user to avoid any obstacle and be safe from any accident. This activity includes the MySQL approach to the database and this database is integrated with the map, which returns to the user with the updated info about the route.

The database is updated timely with the sensors and real time communication. How the database is updated is the main core.

Here we will discuss the hardware and software combinations we used to flow this activity back channel in the upcoming sections of methodology chapter.

4.2.1 Details about Hardware

In hardware we are going to discuss the sensors we used which collects the data i.e. detecting the potholes/ hurdles and reports to the system for updating database.

As we given the brief introduction of tools and techniques in previous chapter about hardware. This chapter will clearly define the implementation process.

4.2.1.1 Accelerometer

A standout amongst the most widely recognized inertial sensors is the accelerometer, a dynamic sensor fit for a tremendous scope of detecting. Accelerometers are accessible that can quantify quickening in one, two, or three symmetrical axis. Accelerometer can be of 2 or 4 axis. It can be linear or non-linear with or without gravity of earth.

Accelerometer can also be used to detect earthquakes and many type of other shocks.

They are commonly utilized in one of three modes:

- As an inertial estimation of speed and position;
- As a sensor of tendency, tilt, or introduction in 2 or 3 measurements, as referenced from the increasing speed of gravity ($1\text{ g} = 9.8\text{m/s}^2$);

There are impressive points of interest to utilizing a simple accelerometer rather than an inclinometer, for example, a fluid tilt sensor – inclinometers will in general yield twofold data (demonstrating a condition of on or off), along these lines it is just possible to recognize when the tilt has surpassed some thresh-holding edge.

4.2.1.2 Standards of Operation

Most accelerometers are Micro-Electro-Mechanical Sensors (MEMS). The fundamental guideline of activity behind the MEMS accelerometer is the uprooting of a little verification mass carved into the silicon surface of the incorporated circuit and suspended by little shafts. Reliable with Newton's second law of movement ($F = ma$), as a quickening is connected to the gadget, a power creates which uproots the mass. The help bars go about as a spring, and the liquid (normally air) caught inside the IC goes about as a damper, bringing about a second request lumped physical framework. This is the wellspring of the constrained operational transmission capacity and non-uniform recurrence reaction of accelerometers.

4.2.1.3 Specifications

A commonplace accelerometer has the accompanying essential determinations:

- Analog/computerized
- Number of axes
- Output extend (most extreme swing)
- Sensitivity (voltage yield per g)
- Dynamic run
- Bandwidth
- Amplitude steadiness
- Mass

4.2.1.4 Uses

The increasing speed estimation has an assortment of employments. The sensor can be completed in a structure that distinguishes speed, position, daze, vibration, or the expanding velocity of gravity to choose presentation (Doscher 2005). A structure involving two symmetrical sensors is fit for identifying pitch and roll. This is useful in getting head advancements. A third symmetrical sensor can be added to the framework to obtain presentation in three-dimensional space. This is fitting for the acknowledgment of pen focuses, etc. The detecting capacities of this system can be advanced to six degrees of spatial estimation opportunity by the expansion of three symmetrical gyrators. As a stun indicator, an accelerometer is searching for changes in increasing speed. This jolt is detected as an overdamped vibration. Michiel Verplaetse has laid out the data transmissions related with different executions of accelerometers as an information gadget.

These are:

Location	Usage	Frequency	Acceleration
Head	Tilt	0-8 Hz	Xx
Head,Wrist,Finger	Cont.	8-12 Hz	0.04-1.0 g
Hand,Arm,Upper Body	Cont.	0-12 Hz	0.5-9.0 g
Foot, Leg	Cont.	0-12 Hz	0.2-6.6 g

Table 1 executions of accelerometer

Depending on the sensitivity and dynamic range required, the cost of an accelerometer can grow to thousands of dollars. Nonetheless, highly accurate inexpensive sensors are available. Each reading has an alternate position and edge predominantly with x,y and z pivot likewise with positive and negative readings. Sharp bounce or pot opening can quicken movement that can be obviously recognized. These readings are recorded in the database to get the dimension of stun and the applying some channel the information can be characterized into gatherings.

4.2.1.5 Design Constraints

Hard Drive Space:	SCALE: The application's need of hard drive space. MUST: No more than 20 MB. PLAN: No more than 15 MB. WISH: No more than 10 MB. DEFINED: Megabyte
Application Memory Use:	MEASURE: Interpretations done from the performance log during testing. NECESSITY: No more than 20 MB. PLAN: No more than 16 MB. DESIRE: No more than 10 MB.

4.2.2 Details about Software

The software techniques and platforms used will be discussed in this section. As this is Android studio-based app using Java as scripting language so this is necessary to give overview of Android studio.

4.2.2.1 Android Studio Overview

Android Studio is the authority IDE for Android application advancement

Over the capacities you anticipate from IntelliJ, Android Studio offers:

- Flexible gradle-based form structure.
- Build distinctions and different apk record age.
- Code designs to enable you to assemble normal application highlights.
- Rich policy manager with help for intuitive topic altering.
- Lint devices to get execution ease of use, rendition similarity, and different issues
- Pro Guard and application marking abilities
- Built-in help for Google Cloud Platform, making it simple to incorporate Google Cloud Messaging and App Engine and significantly more.
- Android Virtual Device to simulate environment.

4.2.2.2 Android Build System

The Android assemble framework is the toolbox you use to construct, test, run and bundle your applications. This fabricate framework replaces the Ant framework utilized with Eclipse ADT. It can keep running as a coordinated apparatus from the Android Studio menu and freely from the direction line. You can utilize the highlights of the assemble framework to:

- Customize, design, and broaden the fabricate procedure.
- Create numerous APKs for your application with various highlights utilizing a similar undertaking and modules.
- Reuse code and assets crosswise over source sets.

The adaptability of the Android fabricate framework empowers you to accomplish the majority of this without changing your application's center source documents. To assemble an Android Studio venture, see Building and Running from Android Studio. To design custom form settings in an Android Studio venture, see Configuring Gradle Build.

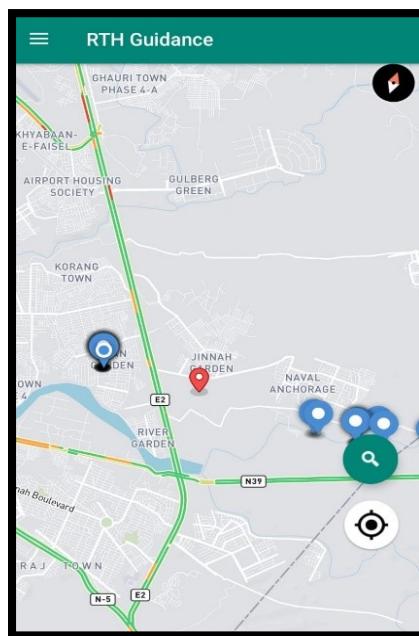


Figure 14 User interface RTH Guidance

Figure 14 shows a fully loaded interface the blue markers are the hurdles detected by application and saved into database. Green lines are showing the traffic value on the roads. If the traffic value is high the road lines will become yellow and if it is blocked the road lines will become red.

4.2.2.3 Memory Monitor

Android Studio gives a memory screen see so you can all the more effectively screen your application's memory utilization to discover deallocated objects, find memory holes and track the measure of memory the associated gadget is utilizing. With your application running on a gadget or emulator, click the Memory Monitor tab in the lower right corner to dispatch the memory screen.



Figure 15 Memory Monitor Screen

(Figure 15 show memory used by the application during usage).

4.2.2.4 Dynamic format review

Android Studio enables you to work with formats in both a Design View. To see effectively select and see format changes for various gadget pictures, show densities, UI modes, areas, and Android adaptations (multi-API rendition rendering).

4.2.2.5 Firebase Real-time Database

The Firebase real-time Database is a cloud-facilitated database. Information is put away as JSON and synchronized in real-time to each associated customer. When you assemble cross-stage applications with our iOS, Android, and JavaScript SDKs, the majority of your customers share one real-time Database occurrence and consequently get refreshes with the most up to date information. Firebase's first product was the Firebase Real-time Database, an API that synchronizes application data across iOS, Android, and Web devices, and stores it on Firebase's cloud. The product assists software developers in building real-time, collaborative applications. Other products are: Analytics, Authentication, Cloud Firestore, Cloud Functions, Cloud Messaging etc.

4.2.2.6 Key capacities of Firebase

Real-time	Instead of regular HTTP demands, the Firebase real-time Database utilizes information synchronization—each time information changes, any associated gadget gets that update inside milliseconds. Give synergistic and vivid encounters without contemplating organizing code.
Offline	Firebase applications remain responsive despite when disengaged in light of the way that the Firebase constant Database SDK proceeds with your data to plate. At the point when system is reestablished, the client device gets any movements it missed, synchronizing it with the present server state.
Available from Client Devices	The Firebase ongoing Database can be gotten too direct from a wireless or web program; there's no prerequisite for an application server. Security and data endorsement are open through the Firebase continuous Database Security Rules, enunciation based rules that are executed when data is examined or made..
Scale over various Databases	With Firebase ongoing Database on the Blaze assessing plan, you can reinforce your application's data needs at scale by part your data over various database events in a comparative Firebase adventure. Streamline approval with Firebase Authentication on your endeavor and affirm customers over your database events. Control access to the data in each database with custom Firebase continuous Database Rules for each database event.

The Firebase real-time Database gives you a chance to fabricate rich, communitarian applications by enabling secure access to the database legitimately from customer side code. Information is endured locally, and even while disconnected, real-time occasions keep on terminating, giving the end client a responsive encounter. At the point when the gadget recaptures association, the real-time Database synchronizes the neighborhood information changes with the remote updates that happened while the customer was disconnected, combining any contentions naturally. The real-time

Database gives an adaptable, articulation-based principles language, called Firebase real-time Database Security Rules, to characterize how your information ought to be organized and when information can be perused from or written to. At the point when coordinated with Firebase Authentication, designers can characterize who approaches what information, and how they can get to it. The real-time Database is a NoSQL database and, in that capacity, has diverse advancements and usefulness contrasted with a social database. The real-time Database API is intended to just permit activities that can be executed rapidly. This empowers you to assemble an extraordinary real-time experience that can serve a great many clients without settling on responsiveness. Along these lines, it is essential to consider how clients need to get to your information and after that structure it in like manner.

4.2.2.7 How information is organized: it's a JSON tree

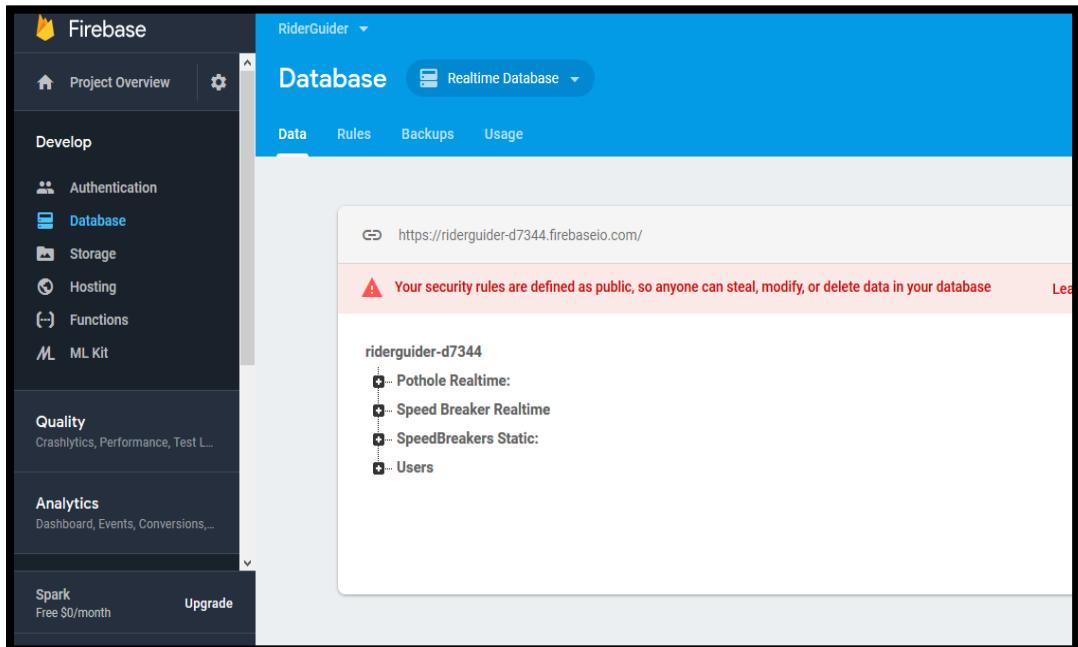


Figure 16 Firebase Real-time database menu

(Figure 16 shows database table keys Firebase database).

All Firebase Real-time Database information is put away as JSON objects. You can think about the database as a cloud-facilitated JSON tree. In contrast to a SQL database, there are no tables or records. When you add information to the JSON tree, it turns into a hub in the current JSON structure with a related key. You can give your own keys, for example, client IDs or semantic names, or they can be accommodated you utilizing `push()`.

An online, interactive JSON Schema validator. Supports JSON Schema Draft 3, Draft 4, Draft 6 and Draft 7.

[View source code](#)

Select schema: Schema Draft v7

Input JSON:

```

1 [ {
2   "PhoneNumberTypeID": 1,
3   "Name": "Cell",
4   "ModifiedDate": "2017-12-13T13:19:22.273"
5 },
6   {
7     "PhoneNumberTypeID": 2,
8     "Name": "Home",
9     "ModifiedDate": "2017-12-13T13:19:22.273"
10 },
11   {
12     "PhoneNumberTypeID": 3,
13     "Name": "Work",
14     "ModifiedDate": "2017-12-13T13:19:22.273"
15   }
16 ]
17 ]

```

✓ No errors found. JSON validates against the schema

Figure 17 Adding Data Into Json

(Figure 18 shows adding data into a json tree format).

```
{
  "destination_addresses" : [ "Apethorpe, Peterborough PE8 5AQ, UK" ],
  "origin_addresses" : [ "Hatfield AL10, UK" ],
  "rows" : [
    {
      "elements" : [
        {
          "distance" : {
            "text" : "114 km",
            "value" : 114425
          },
          "duration" : {
            "text" : "1 hour 21 mins",
            "value" : 4859
          },
          "status" : "OK"
        }
      ]
    },
    "status" : "OK"
  ]
}
```

Figure 18 Received Response in Json

(Figure 17 shows a response of json tree data after request).

4.2.2.8 Abstain from settling information

Since the Firebase real-time Database permits settling information up to 32 levels profound, you may be enticed to feel this ought to be the default structure. Be that as it may, when you get information at an area in your database, you additionally recover the majority of its youngster hubs. What's more, when you allow somebody read or compose access at a hub in your database, you additionally give them access to all information under that hub. Consequently, by and by, it's ideal to keep your information structure as level as could be allowed.

Numerous Firebase-fueled applications comprise of just customer code, and needn't bother with something besides Firebase and an approach to convey your application to work. They're perfect if:

- You're building up a fresh out of the box new application, or reworking a current one starting with no outside help.
- Your application needs insignificant reconciliation with inheritance frameworks or other outsider administrations.
- Your application doesn't have substantial information handling needs or complex client confirmation necessities.
- Your application doesn't have backing or help section.
- Your application needs bug report as a fundamental piece of utilization.
- Your application should run easily and should be accessible day in and day out.
- Your application should include technical support section.

In this engineering, your application just comprises of static substance and resources, and all your dynamic substance and client information is put away and recovered from Firebase. The information we use to report and help is sent to the application director if there is bug the manager or engineer of use will fix it and send the update. In the event that there is some other issue with respect to utilizing application the FAQ area will respond to the inquiries. Specialized help for any application is must to make it fruitful and valuable. Every single interface and area ought to be reported so that there each issue can settled on schedule. The client should have a sense of security while utilizing application. By giving great cooperating plan the client of use can be kept keen on utilizing application. Interfacing plan and topics give great input.

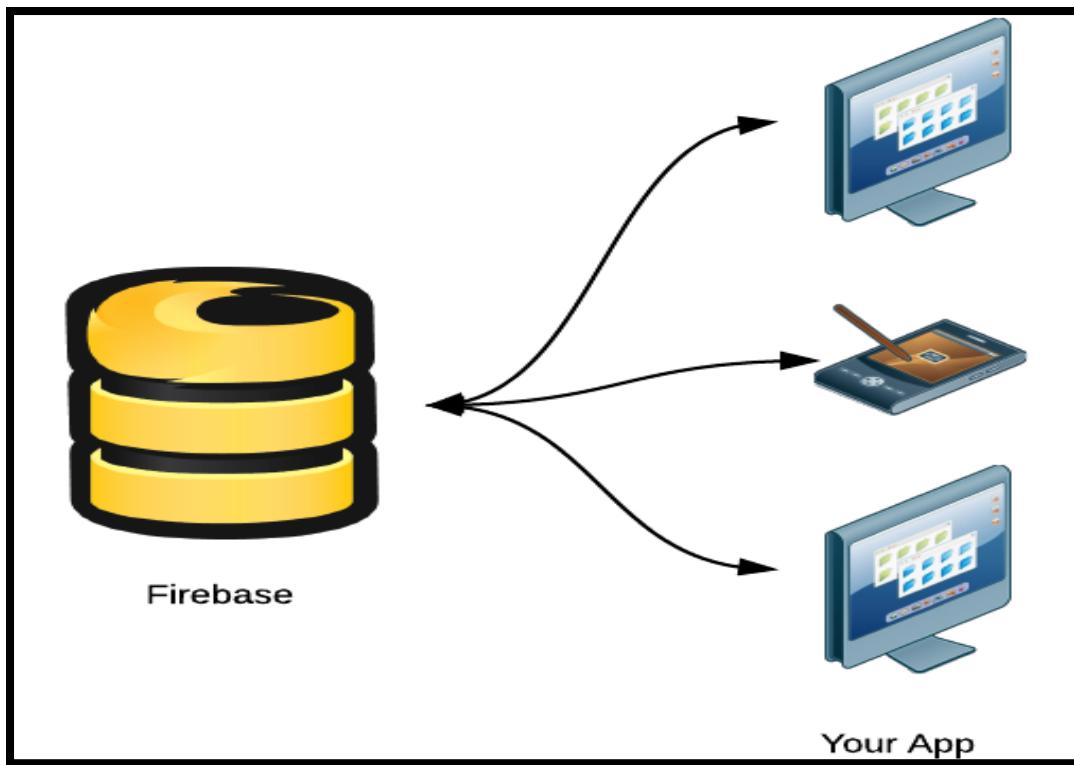


Figure 19 Firebase Description

(Figure 19 shows how firebase database and application interact).

4.2.2.9 Write offline data

On the off chance that a customer loses its system association, your application will keep working effectively. Each customer associated with a Firebase database keeps up its very own inside rendition of any dynamic information. At the point when information is composed, it's kept in touch with this nearby form first. The Firebase customer at that point synchronizes that information with the remote database servers and with different customers on a "best-exertion" premise. All the work required with the database trigger nearby occasions promptly, before any information is kept in touch with the server. This implies your application stays responsive paying little heed to arrange inertness or network. When network is restored, your application gets the fitting arrangement of occasions so the customer matches up with the present server state, without composing any custom code.

4.2.2.10 Map Box vs Google Map

Google Maps is a pervasive nearness on contact pages and store discoverers over the web, yet the ongoing value climb may make the administration unreasonably costly for some locales. Beginning in July 2018, Google cut the point of confinement with the

expectation of complimentary Dynamic Maps JavaScript API calls from 25,000 every day to 28,000 every month. Google additionally now requires all API calls to utilize a substantial API key. That API Key must be connected to a Google Cloud Platform charging account. Google Maps database contains on high goals satellite and aeronautical nonexistent yet goals changes from zone to region the most populated territories permit more zoom in (up to 23 zoom dimensions) while different zones like seas don't bolster high goals pictures. Google Maps for mobiles the most mainstream

FREE MONTHLY USAGE (\$200 VALUE)		PRICE PER THOUSAND CALLS	
Monthly volume range		0–100,000	100,001+
Native Static Maps	Unlimited loads	\$0.00	\$0.00
Native Dynamic Maps	Unlimited loads	\$0.00	\$0.00
Embed	Unlimited loads	\$0.00	\$0.00
Embed Advanced	Up to 14,000 loads	\$14.00	\$11.20
Static Maps	Up to 100,000 loads	\$2.00	\$1.60
Dynamic Maps	Up to 28,000 loads	\$7.00	\$5.60
Static Street View	Up to 28,000 panos	\$7.00	\$5.60
Dynamic Street View	Up to 14,000 panos	\$14.00	\$11.20

Figure 20 Maps Comparison

(Figure 20 show price comparison and monthly usage per request). versatile application with establishment on 54% of every advanced cell gives huge potential to organizations and individuals to exploit that tremendous usage. On enormous preferred position of utilizing. Mapbox was bootstrapped in 2010 with accentuation on open information and open source advancements. It starts building guide pictures utilizing NASA LANCE-MODIS open area information. The BIG objectives requests enormous float in like manner approaches so is the situation with Mapbox, they imagined another methodology wherein they construct a pile of all pictures of a territory and after that pick the least overcast picture.

Mapbox to the Rescue

Usefulness

Mapbox is a guide and area information stage (and Google Maps elective). It brags exceptionally adjustable, point by point, and intuitive maps. A significant number of Google Maps' highlights have comparative usefulness on Mapbox. Mapbox offers

custom markers, heatmaps, marker bunching, and significantly more. With Mapbox, your guide can include standard markers, custom markers (with content!), marker groups, ways, shapes, and even custom styles. Mapbox gives magnificent help and guide being developed of the application with effectively justifiable usage controls when contrasted with google. Mapbox map view is more easy to understand and user-friendly.

Mapbox Studio

Mapbox Studio is another reasonable preferred standpoint over Google Maps. Mapbox Studio is an application that empowers you to structure totally custom maps and make reusable datasets. It's incredible for making attractive maps and working with huge datasets.

Cost

Mapbox dynamic maps are likewise far more affordable than Google Maps' Dynamic Maps. In the month since that movement site changed from Google Maps to Mapbox, they've spared about 92% of what Google Maps' new valuing model would have cost them. That outcomes in rough reserve funds of over \$28,000 for the year.

Google Maps Platform Dynamic Maps	Up to 28,000 loads/month Free 0-100,000/month 7.00 USD per 1000 100,001-500,00/month 5.60 USD Per 1000
Map Box Dynamic Maps	50,000/month Free 1,000 web map views 0.50 USD

Table 2 Cost Comparison google vs map

Map box can make maps from a large number of indistinguishable kinds of information from Google Maps. Comparative information sources and comparable usefulness mean it's anything but difficult to change from Google Maps to Map box. The previously mentioned travel site is one of the biggest, most seasoned, and most complex destinations that Masuga Design works with. Indeed, even on that site, it took under about fourteen days to do the switch. The customer even leans towards the look and usefulness of the Map box maps over the past Google Maps setup.

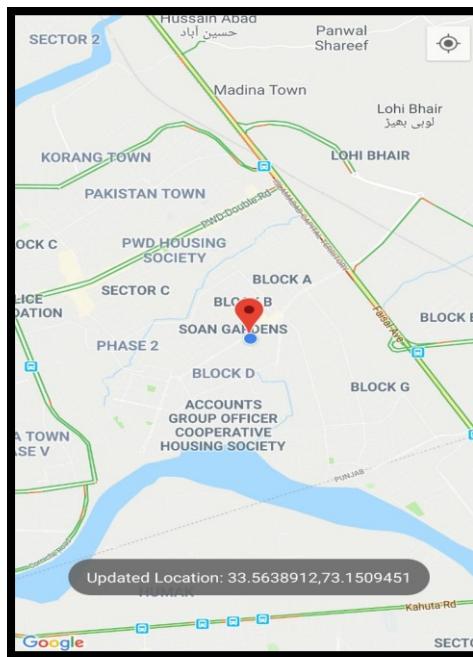


Figure 21 Map updation of Location

(Figure 21 shows data collection app loaded and updating location every 5 seconds).

4.2.3 Details about Controls/Communication

The **Route turns and hurdle guidance app** system shall use MQTT protocol for communication between server & database. Internet will be required for android application to locate the user through GPS.

4.2.3.1 History of MQTT

MQTT stands for MQ Telemetry transport. It is a communication protocol. Its brief history is described below. The following session will help to understand its working and main operations.

MQTT was made by Dr. Andy Stanford-Clark of IBM and Arlen Nipper of Arcom - presently Eurotech - in 1999 as a practical, dependable approach to interface checking gadgets utilized in the oil and gas ventures to remote undertaking servers. At the point when tested with figuring out how to drive information from pipeline sensors in the desert to off-site SCADA (supervisory control and information securing) frameworks, they settled on a TCP/IP-based distribute/buy in topology that would be occasion headed to keep satellite connection transmission costs down. Despite the fact that MQTT is still intently connected with IBM, it is presently an open convention that is directed by the Organization for the Advancement of Structured Information Standards

(OASIS). Despite the fact that the name recommends it, MQTT isn't a piece of the first IBM MQ arrangement; be that as it may, as of variant 7.1, it is accessible in WebSphere MQ. MQTT was recently known as the SCADA convention, MQ Integrator SCADA Device Protocol (MQIsdp) and WebSphere MQTT (WMQTT), albeit these varieties have dropped out of utilization.

4.2.3.2 MQTT working Principle

A MQTT session is partitioned into four phases: association, verification, correspondence and end. A customer begins by making a TCP/IP association with the intermediary by utilizing either a standard port or a custom port characterized by the merchant's administrators. While making the association, perceive that the server may proceed with an old session in the event that it is given a reused customer character.

The standard ports are 1883 for non-encoded correspondence and 8883 for scrambled correspondence utilizing SSL/TLS. Amid the SSL/TLS handshake, the customer approves the server endorsement to validate the server. The customer may likewise give a customer endorsement to the agent amid the handshake, which the dealer can use to confirm the customer. While not explicitly part of the MQTT determination, it has turned out to be standard for representatives to help customer verification with SSL/TLS customer side testaments. Since the MQTT convention plans to be a convention for asset obliged and IoT gadgets, SSL/TLS may not generally be an alternative and, at times, probably won't be wanted. In such cases, confirmation is displayed as an unmistakable content username and secret key that is sent by the customer to the server as a feature of the CONNECT/CONNACK bundle grouping. A few representatives, particularly open specialists distributed on the web, will acknowledge mysterious customers. In such cases, the username and secret phrase are essentially left clear. MQTT is known as a lightweight convention since every one of its messages have a little code impression. Each message comprises of a fixed header - 2 bytes - a discretionary variable header, a message payload that is constrained to

256 MB of data and a nature of administration (QoS) level. The three distinctive nature of administration levels decide how the substance is overseen by the MQTT convention. Albeit larger amounts of QoS are increasingly solid, they have more dormancy and transfer speed necessities, so buying in customers can determine the most noteworthy QoS level they might want to get.

The most straightforward QoS level is unacknowledged administration. This QoS level uses a publish parcel arrangement; the distributor makes an impression on the dealer one time and the intermediary passes the message to supporters one time. There is no component set up to ensure the message has been gotten effectively, and the dealer does not spare the message. This QoS level may likewise be alluded to as at most once, QoS, or fire and overlook.

4.2.3.3 MQTT protocols implementation and use cases

Facebook presently utilizes MQTT for their errand person application, not just in light of the fact that the convention rations battery control amid cell phone-to-telephone informing, yet additionally on the grounds that, regardless of conflicting web associations over the globe, the convention empowers messages to be conveyed proficiently in milliseconds. MQTT protocols are sophisticated and need very deep knowledge. Because the internet is not available at some locations so to tackle this problem MQTT protocols are used with wireless communication.

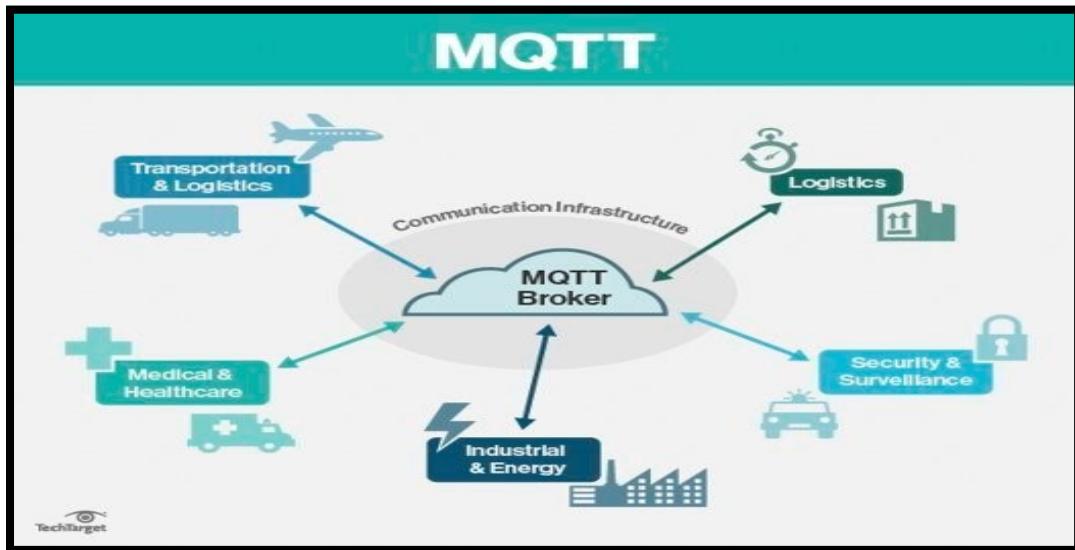


Figure 22 Applications of MQTT

(Figure 22 show the applications of MQTT and its usage).

4.2.3.4 What is the Advantage of utilizing MQTT over Firebase?

The fundamental favorable position of utilizing MQTT is it is lightweight. So, on the off chance that you are on a moderate system, utilizing Firebase can be a weight since it utilizes HTTP and a generally high data transfer capacity. On the off chance that your system is entirely questionable, even a little flag drop can interfere with your

correspondence with the IoT gadget. But since MQTT is so lightweight it can convey in the greater part of these situations and can be in all respects effectively used to transmit your IoT sensor/gadget readings.

4.2.3.5 Challenging Protocols

Other exchange conventions under thought for IoT gadgets with obliged assets incorporate the Constrained Application Protocol (CoAP), which utilizes a solicitation/reaction correspondence design, and the Advanced Message Queuing Protocol (AMQP), which, as MQTT, utilizes a distribute/buy in correspondence design.

4.3 Verifications of Functionalities

This subsection contains the prerequisites for the *Route turn and Hurdle Guidance Application*. These prerequisites are composed by the highlights talked about in the vision record. Highlights from vision report are then refined into utilization case outlines and to succession graph to best catch the utilitarian necessities of the framework. All these practical necessities can be followed utilizing recognition grid.

Designed to client request.

- The framework will show every one of the courses which are illuminated by framework.
- The framework will enable client to choose the Route.
- The framework will show all the accessible Routes.
- The framework will tell the client about any contention in the present setup.
- The system shall allow user to update the configuration to resolve conflict in the current configuration.
- The system shall allow user to confirm the completion of current configuration.
- The framework will allow client to drive safely and reach destination.
- The system will use the information collected and provide it to the framework to allow user visualize hurdles.
- The framework will navigate client towards destination with notification of hurdles and turn by turn.
- The access to framework should be safe and secure.
- The framework should have help section to solve problems.

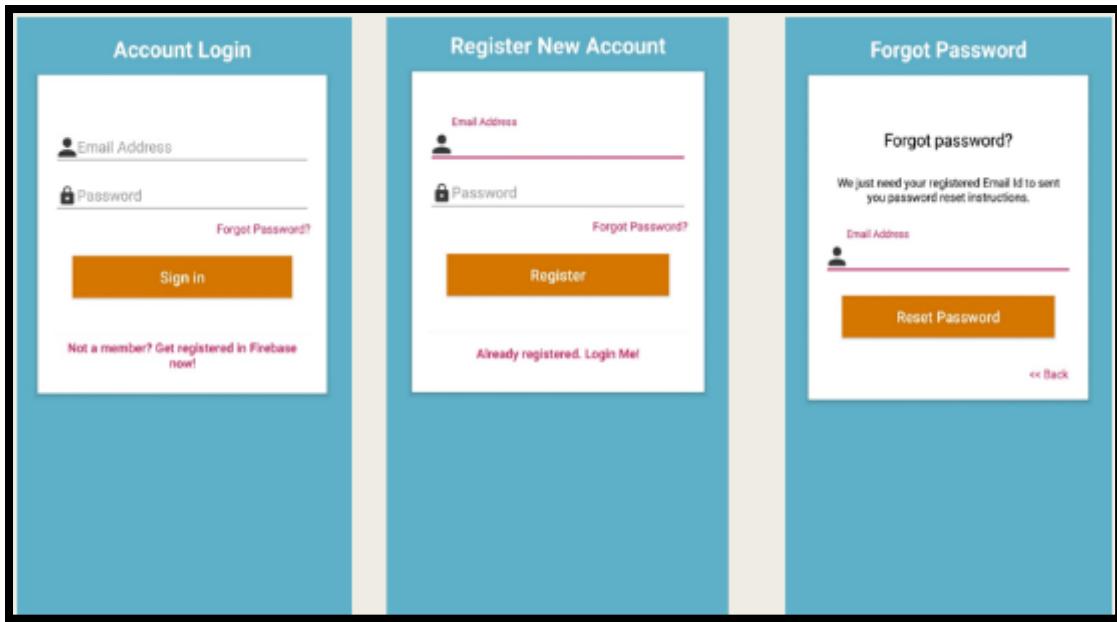


Figure 23 User Activity GUI

Figure 23 shows account management activities left interface shows account login if already registered middle interface shows new registration of account and right interface is if a user forgot password.

Provide comprehensive service details.

- The system shall provide detail information about routes.
- User requests the system for route indication.

Detail product categorization.

- System shows the splash activity.
- Then system shows the Map activity
- User has to provide search query of routes.

Provide personalized profile.

- The system shall display both the guided map and unguided map.
- The system shall display details information about the searched route.
- The system shall display the most accurate route.

Provide user support

- The system shall allow user to enter the service information for the support.
- The system shall allow user to enter contact number for support personnel to call.

Hurdle and turn Notification

- The system shall send a notification for upcoming hurdle and turn

Detailed Description for user

- The system shall display detailed Info about route.

Allow change of Route

- The system shall display the route that is eligible to change.

Map activity

- The system shall provide map to select the location of user.

4.4 Summary

The hardware and software requirements along with the proposed main methodology is described in details. The main purpose of this chapter was to give detailed awareness to the reader of this article regarding our work. The application is secured by password if anyone wants to use the application he must be registered first this account management is also offered by Firebase database. By using accelerometer reading of z-axis and gps coordinates it successfully stored the data in the firebase database also there can be a garbage data so it should be filtered before used. After applying filter to data the coordinates of the data collected are again marked on the Mapbox mapview. By using combination google distance api the distance is calculated to each of its collected data points if the distance is less than thousand meter the sound plays notifying about the distance and the hurdle and also again if the distance is less than five hundred meter.

Chapter 5

SYSTEM TESTING

This chapter contains the necessities for the Route turns and obstacle direction application. These necessities are composed by the highlights talked about in the vision record. Highlights from vision archive are then refined into utilization case graphs and to grouping chart to best catch the useful necessities of the framework. All these practical necessities can be followed utilizing irreconcilability network.

5.1 Objective Testing

The main objective of any product depends upon the quality. We tried our best to make it a quality product. Objective testing includes the steps as follows to make sure the *RTHGA* working properly.

- Configured to user demand.
- Provide comprehensive service details.
- Detail product categorization.
- Provide personalized profile.
- Provide user support.
- Hurdle and turn Notification.
- Detailed Description for user.
- Allow change of Route.
- Map activity.

The application should be easy to extend. The code should be written in a way that it favors implementation of new functions. Artificial Intelligence can be used to further enhance the capabilities of the application by including image processing and data mining techniques.

The way toward checking the goal is that the application should work in as planned and it ought to give and fulfill the need of its improvement. Mapbox and Google Map Api's give guide and area administrations. Turn by turn route is so useful while moving towards goal. Application is basically useful in two fields initially is driving securely and second is checking road condition. Checking is likewise significant on the grounds that streets ought to be fixed before any accident happen. Application gives all the data from movement time to distance towards goal. Route can be changed whenever additionally it gives the estimation of traffic on street.

5.2 Usability Test

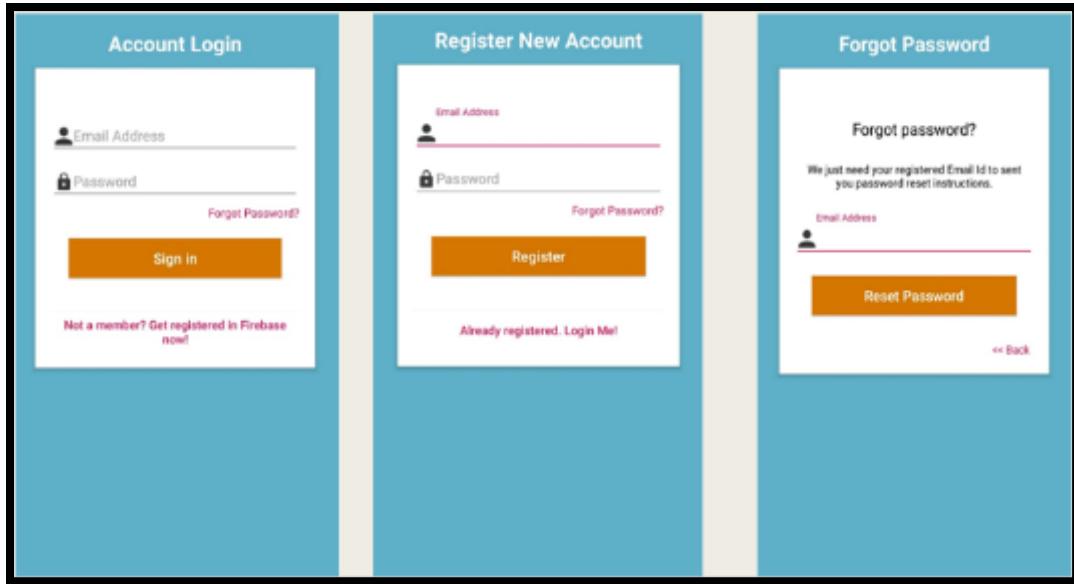


Figure 24 User end GUI

Figure 24 shows account management activities left interface shows account login if already registered middle interface shows new registration of account and right interface is if a user forgot password. Make sure that the system is easy to understand and user friendly. The GUI is understandable and gives proper information.

5.3 Software performance Test

Accomplishment

The item will be established on android and necessities to continue running from the android mobile phone. The item will take starting wait time dependent upon web affiliation quality which moreover depends upon the media from which the item is run. The execution will depend on equipment sections of the customer.

Reliability

Back-end inward PCs.

The framework will give stockpiling of all databases on repetitive PCs with programmed switchover.

The framework will accommodate replication of database to off-site stockpiling areas.

Web access supplier

The framework will give an authoritative understanding a web access supplier for T3 access with 99.99% accessibility

The framework will give a legally binding understanding a web access supplier who can give 99.99% accessibility through their system offices onto the web.

5.4 Compatibility Testing

Compatibility makes sure that it is available to the most of the android version to be accessed by more users.

METER: Measurements obtained from 1000 hours of usage during testing.

MUST: More than 98% of the time.

PLAN: More than 99% of the time.

WISH: 100% of the time.

It is compatible to most of the available browsers.

5.5 Load Testing

Clarify what the framework will not do. Converse prerequisites portray the imperatives on the suitable practices. Numerous individuals think that it's helpful to depict their necessities thusly These prerequisites show the uncertain idea of clients about specific parts of another product item. The framework will not utilize red shading in the UI, at whatever point it is requesting contributions from the end-client.

My SQL database will be utilized to store the data about client and laborers.

Hard Drive Space

SCALE: The application's need of hard drive space.

MUST: No in excess of 20 MB.

PLAN: No in excess of 15 MB.

WISH: No in excess of 10 MB.

Characterized: Megabyte

Application Memory Use

METER: Observations done from the execution log amid testing.

MUST: No in excess of 20 MB.

PLAN: No in excess of 16 MB.

WISH: No in excess of 10 MB.

It must be tested by the number of users to check accessibility whether it works efficiently or not.

5.6 Security Testing

Data Transfer

- The framework will utilize secure attachments in all exchanges that incorporate any secret client data
- The framework will naturally log out all clients after a time of latency.
- The framework will affirm all exchanges with the client's application.
- The framework will not leave treats in the client application containing the client secret phrase.
- The framework will not leave any treats in the client PC containing any of the client's private data.

Data Storage

- The client application will never show client's secret word. It will dependably be resounded with extraordinary characters speaking to composed characters.
- The framework's back end servers will never show a client secret word. The client's secret word might be rest however never appeared.
- The framework's back end servers will just be open to confirmed overseers.
- The framework's back end databases will be scrambled.

5.7 Installation Testing

System to be tested by the installation and working on the system or mobile. Working properly on the available operating system. Most applications have establishment strategies that are required before they can be utilized for their principle reason. Testing these strategies to accomplish an introduced programming framework that might be utilized is known as establishment testing. These method may include full or halfway redesigns, and introduce/uninstall forms.

Check list for the establishment testing is given underneath:

- **Disk Space** accessible capacity to install application.
- **Ram/CPU** accessible ram to run the application.
- **Platform** whether it is android or IOS.
- **Services** sensors and correspondence required.
- **Security** wellbeing and security of the client.

5.8 User Cases

Test Case 1

User Use Case

Use case ID:	UC-5.5.1
Use case name:	User
Actors:	User
Description:	How user can use the app.
Priority:	High
Precaution:	None
Post conditions:	The user will search route
Essential Path:	1:App must be running 2:User must click on search button 3:App must be connected to the Internet
Alternative Scenario:	None

Table 3 User Test Case 1

Use Case 2

Use case ID:	UC-5.5.2
Use case name:	User
Actors:	User
Description:	How user can use the app.
Priority:	High
Precaution:	None
Post conditions:	The user will see the location searched and will start turn by turn navigation
Essential Path:	1:App must be running 2:User must click on search button 3:App must be connected to the Internet
Alternative Scenario:	None

Table 4 User Test Case 2

Chapter 6

RESULTS AND CONSLUSIONS

Results and Conclusion is the phase where we preset proudly the findings of our workings. In this chapter we included our activities, creations of GUIs and the processes. This shows how much success we have gotten and what we are limitations as well as recommendations.

6.1 Presentations of the findings.

6.1.1 Account management activities

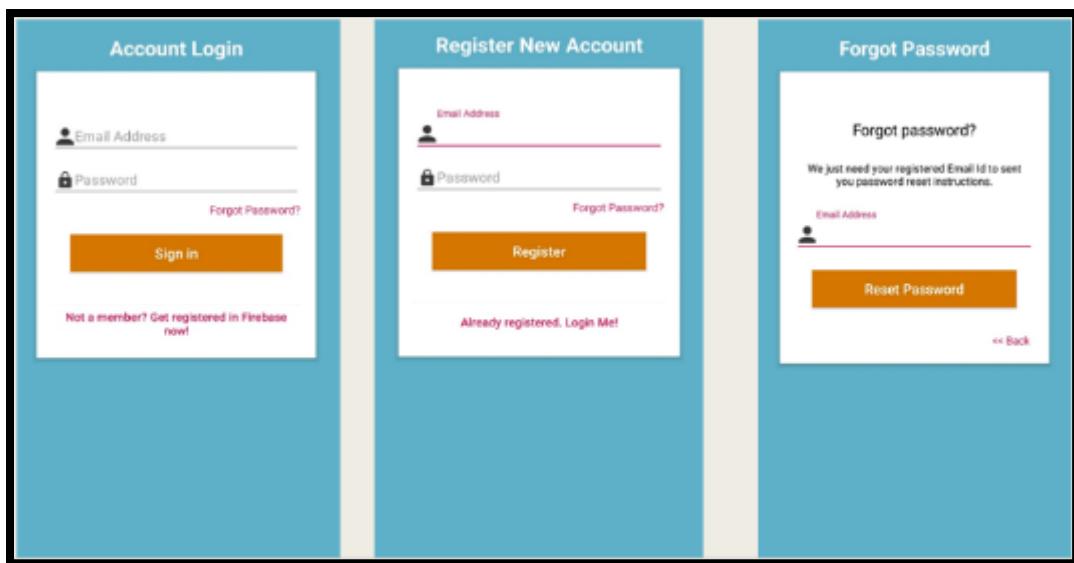


Figure 25 Login GUI

Figure 25 shows account management activities left interface shows account login if already registered middle interface shows new registration of account and right interface is if a user forgot password. Account management activities are used to give a secure access to the system and keep the application safe from any vulnerable access. Login activity is used to get in the system using a safe password if already registered. Register new account activity is used to create a new account. Forgot password activity is used to reset password if someone cannot remember password. The account management activities are to ensure the user safety and secure access to the application. The easy to use condition gives simple access to the client. Login and secret word are put away in a different table inside google firebase database. Just enlisted client can get to the application with certain authorizations and benefits. No one but administrator can alter, update and erase the client. Limited or deceptive access can be blocked.

6.1.2 Main Activity

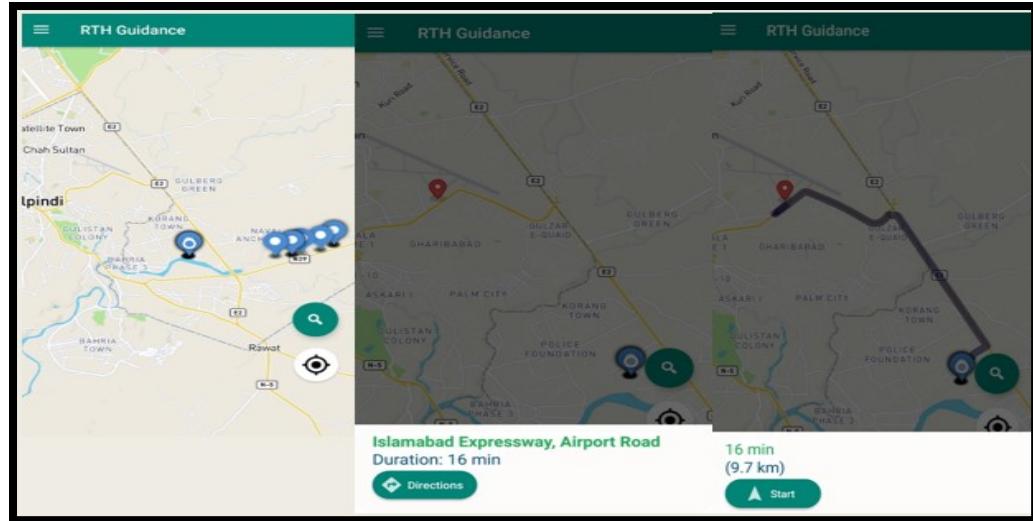


Figure 26 Main Activity of RTHGA

Figure 26 shows main working activities left interface shows fully loaded map 2nd interface from left shows place name and duration 3rd interface from left show line drawn and distance, time. The main activity screen come when successfully logged in. The first screen shown is a loaded map with markers of the collected data. Upon clicking anywhere on map the 2nd screen will be loaded with a red marker and at bottom showing the destination name and duration to reach. Clicking on the directions button will draw the line and calculate distance and if the user press the start button this will start navigation view and automatically navigate user to the destination turn by turn.

6.1.3 Turn by Turn Activity

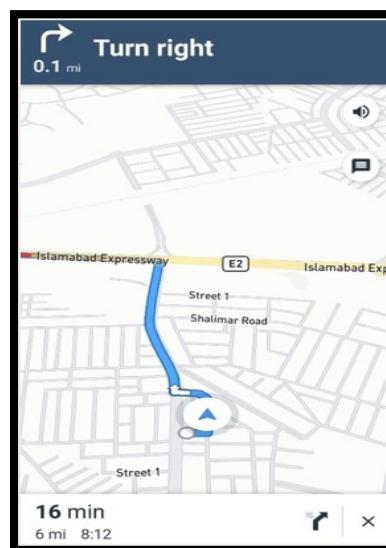


Figure 27 Turn by Turn Activity

(Figure 27 shows a turn by turn activity guiding user).

6.1.4 Search Activity

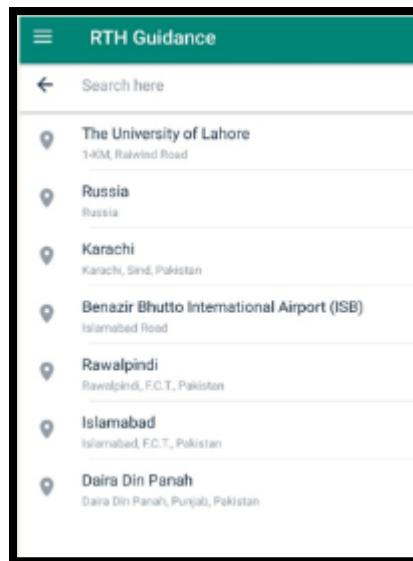


Figure 28 Search Activity

(Figure 28 shows interface of a search activity where user can search any place and navigate to it).

There is a button on main activity for search when the user press the button search activity will open. The user can search any place the world and can navigate to it.

6.1.5 Map Styles

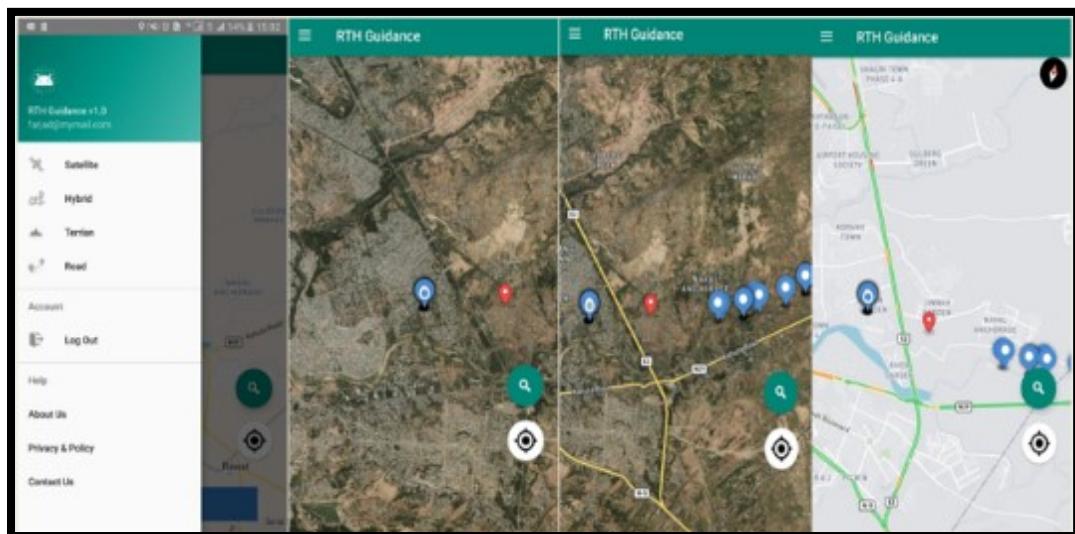


Figure 29 Map Styles

Figure 29 shows interface from left to right 1st interface shows a menu 2nd interface with a satellite view 3rd interface with hybrid view 4th interface is terrain and road traffic. There are different type of map styles in the menu hybrid, satellite, terrain and roads which can show traffic value by marking the road red and green.

6.2 Data Collection App

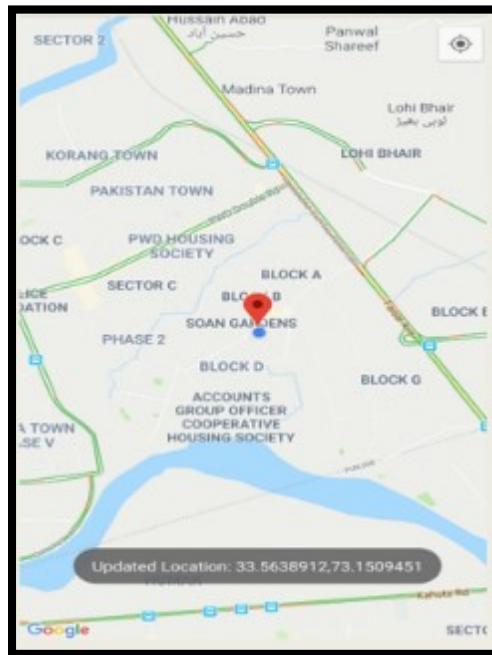


Figure 30 Data Collection App

(Figure 30 shows interface of a data collection app updating its location after every 5 seconds). A data collection app is independent of the user side app its only work is to read accelerometer reading and GPS coordinates and store them into firebase database while vehicle is moving.

6.3 Discussions of the Findings

6.3.1 Comparison of Initial Goal

Initial goal was to build a database of routes. We used firebase and successfully arranged the maps. This helps in utilizations of notifications and app development. We somehow managed to achieve our goal.

6.3.1.1 Expected Time of Arrival

.The name says everything! This element has engaged organizations to offer administrations with an unparalleled exactness in time before the administration or item arrives, something that beyond any doubt charms the clients.

6.3.1.2 Real Time Tracking

Ongoing following of both the client and the specialist organization has empowered straightforwardness in business forms and made a feeling of assurance for clients' conviction/straightforwardness/security.

6.3.1.3 Turn by Turn Navigation

The ETAs for the present organizations have turned out to be unreasonably little. One reason being that drivers can get bearings to get and drop off areas.

6.3.2 Reasoning for short Comings

Execution of every plan needs time and repetitions for betterment. We tried our best to reach the maximum of the goal but due to shortage of time as well as limited resources there are some problem which is the load testing as the number of persons using at a time what affects the system of database. The availability to maximum users through Play Store. It needs some updating features to be available and safely used.

6.4 Recommendations

This methodology can be all around gainfully for secure voyaging particularly in obscure street conditions. Proposed approach can be effectively sent on any android based advanced mobile phone. Aftereffects of the paper demonstrate the acknowledgment of the proposed methodology. In future, the calculation can be tried over various street conditions for increasingly complex situations.

6.5 Summary

This chapter concludes the findings and our presentations what we have achieved with the comparison of our problem statement and purpose of project/ making app. Purpose of the project is to save the maximum users from road incidents.

6.6 Conclusions

The problem statement is very much obligatory for the society's welfare. The measurements must be taken on Government level. This is very serious issue and we have put our input in a direction where we can lead this to broader level. On a major level measurement are needed to be in a proper channel. Pakistan is a country where road surface is a main concern of the country's transportation which is main core of the economy. Every country wants its economy to be on track that's why our objective has a moral value.

Chapter 7

FUTURE WORK

This investigation depicts accelerometer information-based pothole recognition calculations for arrangement on gadgets with constrained equipment/programming assets and their assessment on genuine world information gained utilizing diverse Android OS based PDAs. The assessment tests brought about ideal setup for each chose calculation and the execution investigation in setting of various street abnormality classes show genuine positive rates as high as 90%.

The future work incorporates tries different things with mixes of calculations and improvement of self-alignment usefulness. By adding artificial intelligence and image processing in the application the accuracy and detection can be increased. The usage of application can help the departments of road developments and further enhance their ability to monitor the road and to detect and correct abnormalities. This application can also be used in vehicle tracking and different types readings of road abnormalities can be detected by using different type of vehicles.

Other than this the application can be modified to support external sensors which can be implanted on or inside vehicle these sensors increase the capability of the application to detect with notify with more accuracy. This application will not only reduce the accidents but it will help in monitoring of roads and highways to detect and correct the abnormalities before it becomes lethal for the drivers.

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APPENDICES

Appendix A

Android Studio	Android Studio is an integrated development environment (IDE) from Google that provides developers with tools needed to build applications for the Android OS platform.
GUI	Graphic User Interface
MySQL Lite	The database within the app
Windows	Operating system
Scripting	A scripting language or content language is a programming language that supports the composition of contents, programs composed for a unique runtime condition that can decipher and mechanize the execution of errands that could on the other hand be executed one-by-one by a human administrator.
Graphics	Graphics are visual presentations of app.
SRS	SRS Software Requirement Specification
UX	User experience for using a product.
User	User is the one who use the app to check for routes and hurdles.
System	A system is a set of interacting or interdependent components forming an integrated whole or a set of elements and relationships which are different from relationships of the set.

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