



# **BUS NAVIGATOR**

## **A PROJECT REPORT**



**Submitted by**

**BHARATHI PRIYA D** [723720104010]  
**BRINDADEVI K** [723720104011]  
**DEEPIKA R** [723720104012]

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**ANNA UNIVERSITY: CHENNAI 600 025**

**BONAFIDE CERTIFICATE**

Certified that this project report “ **BUS NAVIGATOR**” is the Bonafide work of the following students, **BHARATHIPRIYA D [723720104010]**, **BRINDADEVI K [723720104011]**, **DEEPIKA R [723720104012]**, who carried out the project work undermy supervision.

**SIGNATURE**

**Mr. P.DINESH KUMAR, M.E.,**

**HEAD OF THE DEPARTMENT**

Department of Computer Science and  
Engineering,

V.S.B College of Engineering Technical  
Campus,

Coimbatore-642109

**SIGNATURE**

**Mrs. B.SUBHASHREE, M.E.,**

**SUPERVISOR**

Department of Computer Science and  
Engineering,

V.S.B College of Engineering Technical  
Campus,

Coimbatore-642109

Submitted for the university project viva voce held on .....at  
V.S.B. College of Engineering Technical Campus in Coimbatore.

**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

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## **ABSTRACT**

A Bus navigation system is a technology that helps bus drivers and passengers navigate through a city or region. It is designed to help bus drivers optimize their routes, save time, and increase efficiency. At the same time, it provides passengers with real-time information about bus locations, routes, and schedules, making it easier for them to plan their trips and reduce waiting times. The use of bus navigation systems has become increasingly popular in recent years, especially in urban areas, where the number of bus routes and stops is high, and traffic congestion is a significant issue. This technology uses GPS (Global Positioning System) and other advanced technologies to track buses and provide real-time information to passengers. One of the primary benefits of a bus navigation system is that it helps bus drivers navigate through traffic and find the best routes to their destinations. This can help reduce travel times, improve on time performance, and save fuel costs. Additionally, it can help bus operators manage their fleets more effectively, by providing them with data about bus location, speed, and other performance metrics. For passengers, a bus navigation system provides a wealth of real-time information that can help them plan their trips more efficiently. This information includes bus schedules, arrival times, and route maps, which can help passengers plan their journeys and reduce waiting times.

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## **LIST OF ABBREVIATIONS**

|     |                               |
|-----|-------------------------------|
| GPS | Global Positioning System     |
| GIS | Geographic Information System |

# **CHAPTER 1**

## **INTRODUCTION**

The bus navigator project is a software application developed to assist people in navigating public transportation systems, particularly buses. Its primary objective is to simplify the process of planning bus routes and finding one's way around new areas or neighborhoods.

Typically, the application features a map of the surrounding region and provides users with up-to-date information about bus schedules and routes. By entering their starting point and destination, the software generates the most efficient bus route, including details like bus stops, transfers, and estimated travel time.

Some bus navigator projects may offer additional capabilities, such as real-time bus tracking, alerts for delays or changes in the schedule, and the ability to save frequently used routes. These features help users plan their trips more effectively, reducing the risk of missed connections or unexpected delays.

In summary, the bus navigator project is a valuable tool for regular commuters and occasional travelers alike. Its goal is to simplify the process of navigating public transportation, making it more accessible and user-friendly.



## **CHAPTER 2**

### **LITERATURE SURVEY**

The use of GPS technology for bus location tracking has become increasingly popular in recent years. There are many different approaches and technologies available, each with its own strengths and weaknesses. Here are some key research papers and articles that provide insight into the current state of the art in this field:

- "Real-time Bus Location Tracking and Arrival Time Prediction System" by Shuai Zhang, Jian Lu, and Zhongzhi Luan. This paper presents a system that uses GPS and real-time data processing to track bus locations and predict arrival times. The system was tested in Beijing and achieved a high accuracy rate in both location tracking and arrival time prediction.
- "A review of GPS-based bus arrival time prediction systems" by Kavi Mahesh, Seshadri Sridharan, and Rajesh Krishnan. This article provides a comprehensive review of the different approaches to bus arrival time prediction using GPS technology. The authors analyze the strengths and weaknesses of each approach and highlight some of the key challenges in this field.
- "Design and Implementation of a Bus Location Monitoring System Based on GPS and GIS" by Hsin-Chih Chang, Chen-Hua Wang, and Yu-Shuo Su. This paper describes a system that combines GPS tracking with GIS (Geographic Information System) to provide real-time bus location information. The system was tested in Taipei and was found to be effective in improving bus operation efficiency.
- "A Study on the Development of a Smart Bus Stop System for Bus Arrival Information" by Dong-Hyeon Kim and Sang-Ho Lee. This paper describes a system that uses GPS technology to provide real-time bus arrival information to passengers at bus stops. The system was tested in Seoul and was found to be effective in reducing passenger waiting times and improving satisfaction.
- "Design and Development of a GPS-Based Fleet Management System for Public Transport" by Sridharan Seshadri, Kavi Mahesh, and Rajesh Krishnan. This paper describes a system that uses GPS technology to track buses in real-time, optimize routes, and monitor driver behavior.

## **2.1 EXISTING PRODUCT**

There are already solutions available that can track the real-time location of vehicles or objects. However, we aim to differentiate ourselves from these existing solutions by not only displaying the distance between us and the bus in kilometers but also by implementing an estimated time display feature that provides an approximate time for the bus to reach us. Additionally, our solution will be user-friendly and accessible via a mobile application that can be easily downloaded and used by anyone.

## **2.2 PROBLEM STATEMENT**

As part of our profession most of us used to travel by bus. At that time we may face difficulty in time keeping. So that we may be too early or too late for the bus. If we are too early we get tired of waiting for long time or if we are late to the bus it may lead to our absence on that particular day and our work or studies will get affected for the one day.

To address these challenges, the bus navigator project has been developed as a solution to help commuter's better plan their bus travel and ensure they arrive at their destination on time. With the bus navigator project, users no longer have to rely on guesswork to determine the most efficient bus route. Instead, they can use the software to access real-time information on bus schedules and routes, including any delays or changes. Furthermore, the bus navigator project can help users avoid the stress of waiting for long periods or missing their bus entirely.

By providing accurate estimates of travel time and suggested arrival times, the software can help users plan their trip to arrive at the bus stop just in time for their bus's arrival. Overall, the bus navigator project is a valuable tool that can help make bus travel more convenient and efficient for commuters. By leveraging technology to provide real-time information and personalized guidance, the software can help users save time, reduce stress, and arrive at their destination on time.

## **CHAPTER 3**

### **PROPOSED SOLUTION**

#### **3.1 OVERVIEW**

The Bus Navigation System we have proposed is designed to simplify the process of tracking and monitoring the location of buses in real-time. This system consists of two Android applications: one for updating the current location of the bus and another for fetching and displaying the location data. By using this system, users can easily determine the current location of the bus and the estimated time of arrival at their destination.

One of the main features of our system is the ability to share the live location of the bus with the users. This feature enables users to track the bus's location in real-time, providing them with accurate information about the bus's current location and movement. The location data is displayed on a user-friendly interface integrated with Google Maps, which makes it easier for users to view the location of the bus. To implement this system, we have used Firebase database as an essential intermediary component between the updater and receiver applications. This enables the two applications to communicate with each other seamlessly and provides a reliable and efficient means of updating the location data.

Moreover, our system ensures that users receive real-time updates and notifications about any changes or delays in the estimated time of arrival. This feature enables users to adjust their schedule accordingly and manage their time more effectively. Overall, the Bus Navigation System we have proposed provides a practical solution to the problem of tracking and monitoring the location of buses in real-time. With its user-friendly interface, real-time updates, and accurate location data, our system is an effective tool for managing transportation related challenges and improving time management.

## CHAPTER 4

### SOFTWARE DESCRIPTION

#### Software's used

- Firebase
- MIT app inventor

#### Firestore

Firestore is a mobile and web application development platform developed by Google. It provides a suite of tools and services for building and managing mobile and web applications, including authentication, real-time database, cloud messaging, storage, and hosting.

One of the main features of Firestore is the real-time database, which allows developers to store and synchronize data in real-time across multiple clients. This makes it easy to build applications that require real-time updates, such as chat apps and collaborative tools.



Figure 4.1 Firestore

Firestore also offers a variety of other services, including hosting for web applications, cloud messaging for sending push notifications to users, and authentication services for securing user accounts.

In addition to these features, Firestore provides extensive documentation and a growing community of developers who use the platform. This makes it easy to learn and use, even for developers who are new to the platform.

Overall, Firebase is a powerful platform for building mobile and web applications, and is a popular choice among developers due to its ease of use, robust feature set, and tight integration with other Google services.

### **MIT app Inventor**

MIT App Inventor (Figure4.2) is a free and open-source visual programming tool that allows users to create mobile applications for Android devices. The platform is based on the concept of "blocks", which users can drag and drop to build the logic of their app.



Figure 4.2 MIT App Inventor

App Inventor was originally developed by Google, but in 2011 it was transferred to MIT (Massachusetts Institute of Technology) where it became an open-source project. Since then, it has been continuously updated and improved by a team of developers and contributors.

One of the key features of App Inventor is its visual interface, which makes it easy for users with little or no programming experience to create functional applications. The platform also provides a wide range of pre- built components, such as buttons, text boxes, and media players, that users can incorporate into their applications.

App Inventor also includes a feature called the "Emulator", which allows users to test their applications on a virtual Android device without the need for a physical device. This makes it easy to iterate and refine the design of an application before deploying it to real- world users.

Overall, MIT App Inventor is a powerful tool for creating mobile applications, especially for users who are new to programming. Its visual interface, pre-built components, and emulator make it easy to build functional applications quickly and efficiently.

## **4.1 PROCEDURE TO CREATE PROJECT**

In this part we are going to discuss about step by step of creating this system

**Step 1:** Problem statement finding and declaration.

**Step 2:** Finding a standard solution to the problem statement.

**Step 3:** Finding the software to be used and getting known about them.

**Step 4:** Creating cloud storage.

**Step 5:** Creating Android Mobile Application for updating and receiving location using MIT App Inventor.

**Step 6:** Create a Firebase account and real time database to store and process location data from the mobile device.

**Step 7:** Connecting both the apps to firebase database.

**Step 8:** Providing write access permissions to location updater app and read access to receiver app.

**Step 9:** Testing communication between location updater app to firebase and firebase to receiver app.

**Step 10:** Building the prototype and the system is ready.

## 4.2 CODING STRUCTURE

### Location Updater app

Location Updater app will update the current latitude and longitude of the device to the firebase. A location updater app tracks the user's location in real- time. When the app is active, it periodically sends location data to a database, which then updates the bus location on a receiver app. This process continues until the user turns off the app or stops sharing their location. The coding for location updater is as follows

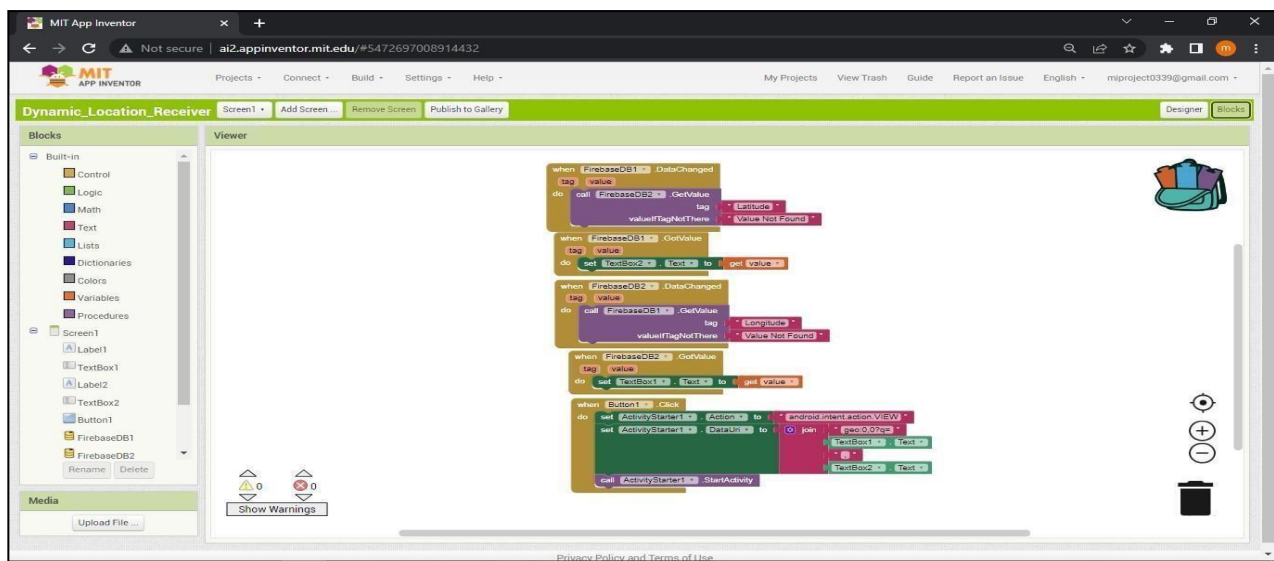


Figure 4.3 Location Updater app coding

The above mentioned set of codes in Figure 4.3 is used to update the current latitude and longitude to the database. Here when the location information changes it is caught by the location sensor and the changed information will be updated in the text boxes that are named as latitude and longitude.

The respective information on the textboxes will be updated in the firebase on the basis of whenever there is a change in the location information it will be reflected in the real-time database.

As we are using a real-time database, the last updated data only will be available. This Location updater app will ask for location access permission and when it is permitted and then it will access the device location and update it. Once it gets started it will continue to fetch location until it is exited explicitly.

## Location Receiver app

Location Receiver app will fetch the latitude and longitude from the firebase database in a real-time manner. The fetched information such as latitude and longitude will be displayed in the app and the data will get updated dynamically whenever there is change in the database value.

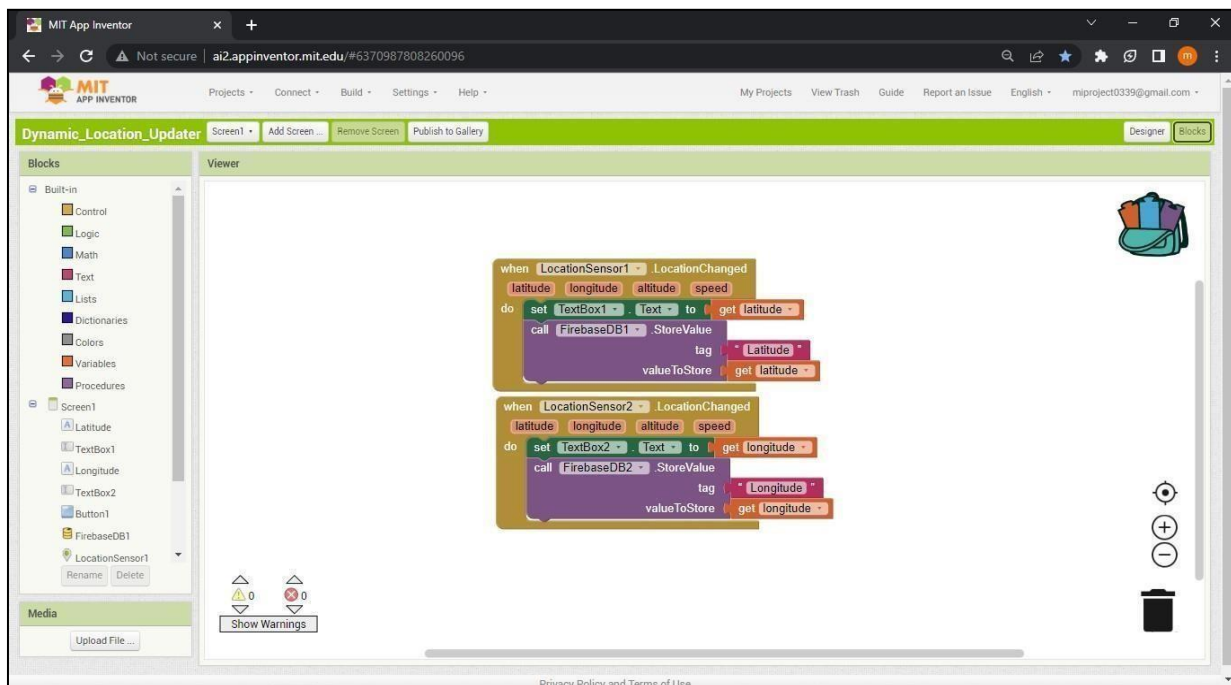


Figure 4.4 Location Receiver App

The above displayed (figure 4.4) illustrates the code for the Location Receiver App. It is coded as whenever there is change in data in database the value will be fetched and it will be reflected in this app and whenever we need to see the location we can click with 'Open in Google Map' to see the current location of the bus in Google map.

It ensures the live location of the bus as the live location information of the bus will be updated to the firebase. The location information will be accurate as we are getting those information in the form of latitude and longitude.



## User Interface of Location Updater App

The UI of the locations updater app will be as follow

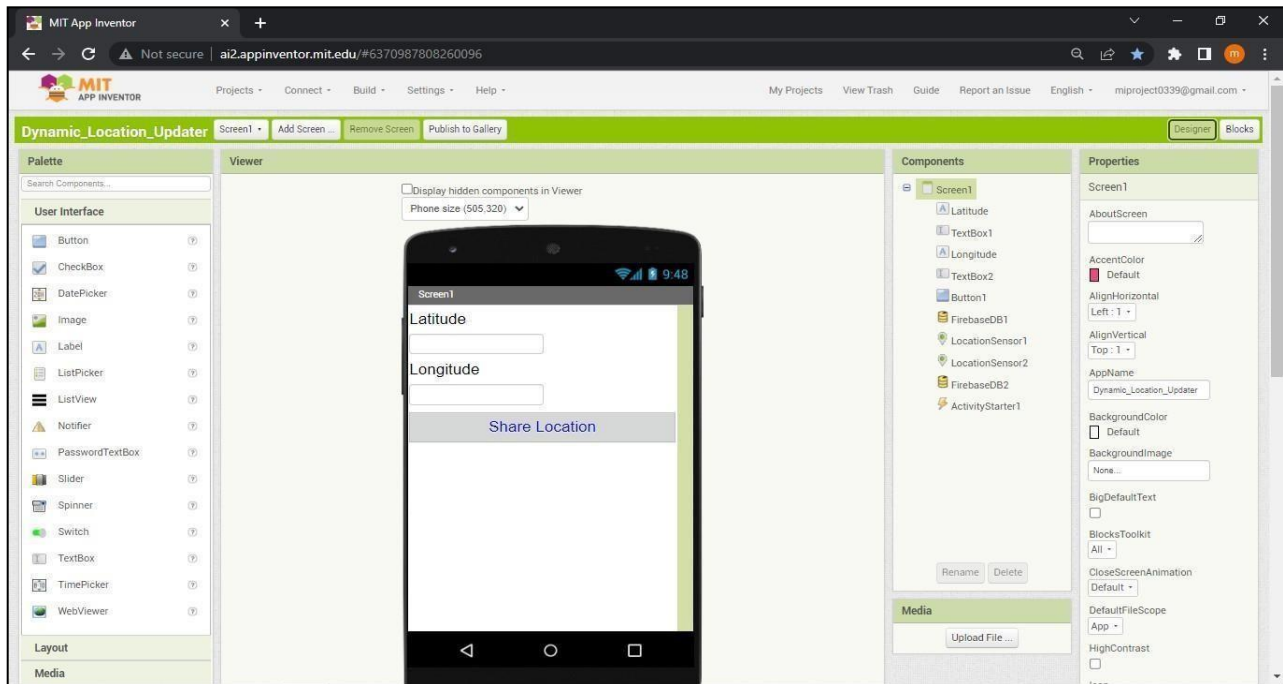


Figure 4.5 UI of Location updater app

The App will latitude and longitude labels and are followed by the text boxes where the latitude and longitude of the device will be displayed. On overviewing this whenever we move from one place to the other we can evident the latitude and longitude information are getting changed.

## User Interface of Location Receiver App

The user interface of the Location Receiver app is as follows

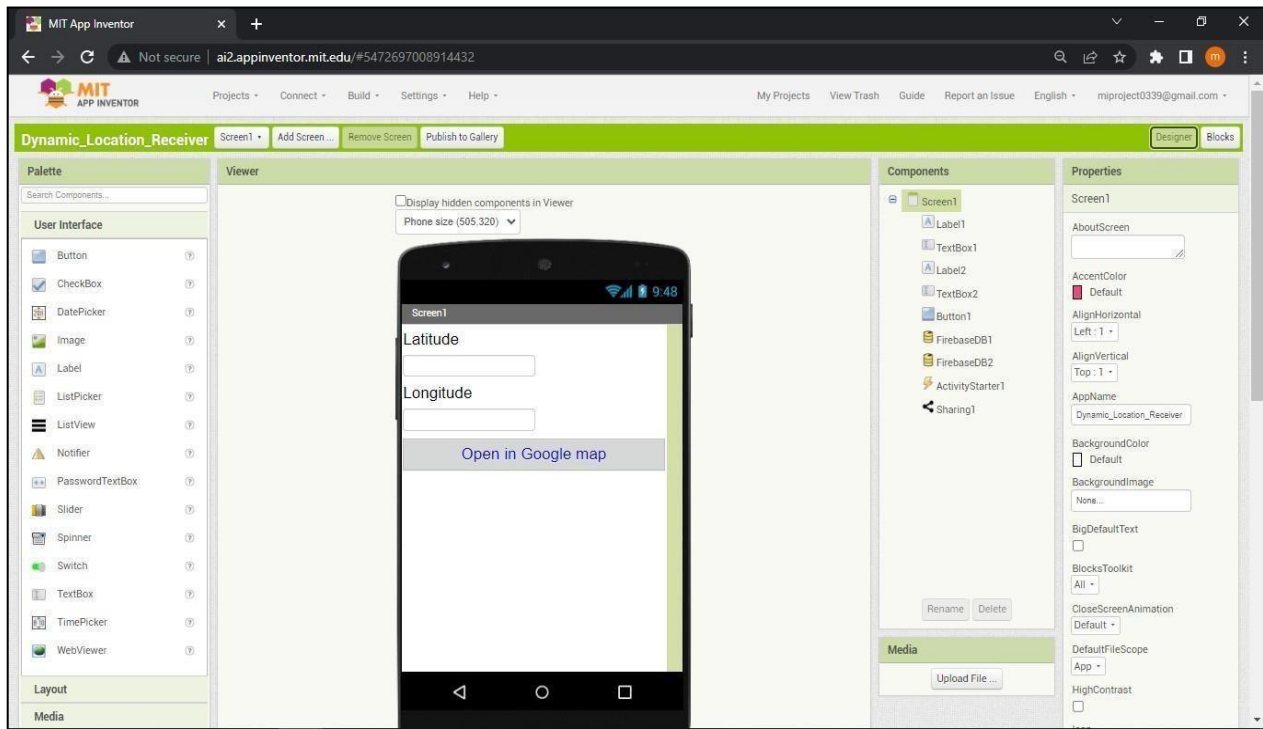


Figure 4.6 UI of Location receiver App

## FIREBASE DATABASE

The user interface of the Firebase database is as follows

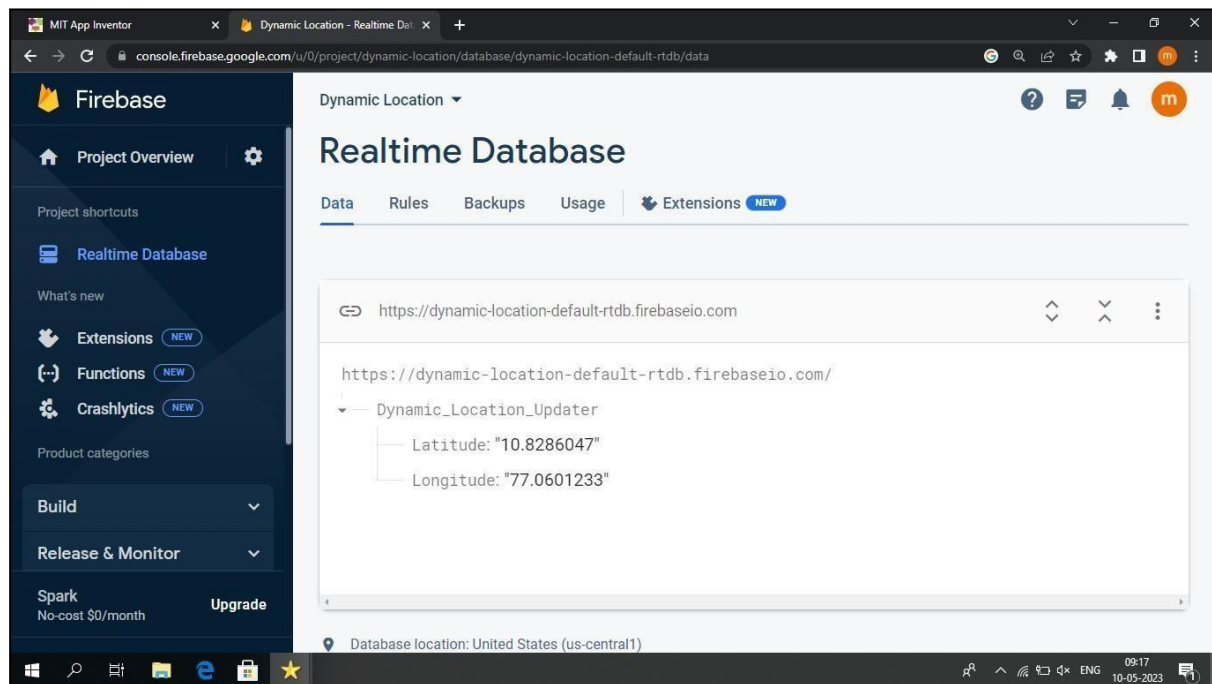


Figure 4.7 Firebase Database

The firebase real-time database (Figure 4.7) is used to store location data in real time. At the same time it gets location data from updater app and also sends location data to receiver app.

## CHAPTER 5

### RESULTS & IMPLEMENTATIONS

In this chapter we will discuss the prototype and the result we got from the bus navigator project. We have built two separate applications using MIT app inventor such as location updater and location receiver.



Figure 5.1 Location updater app

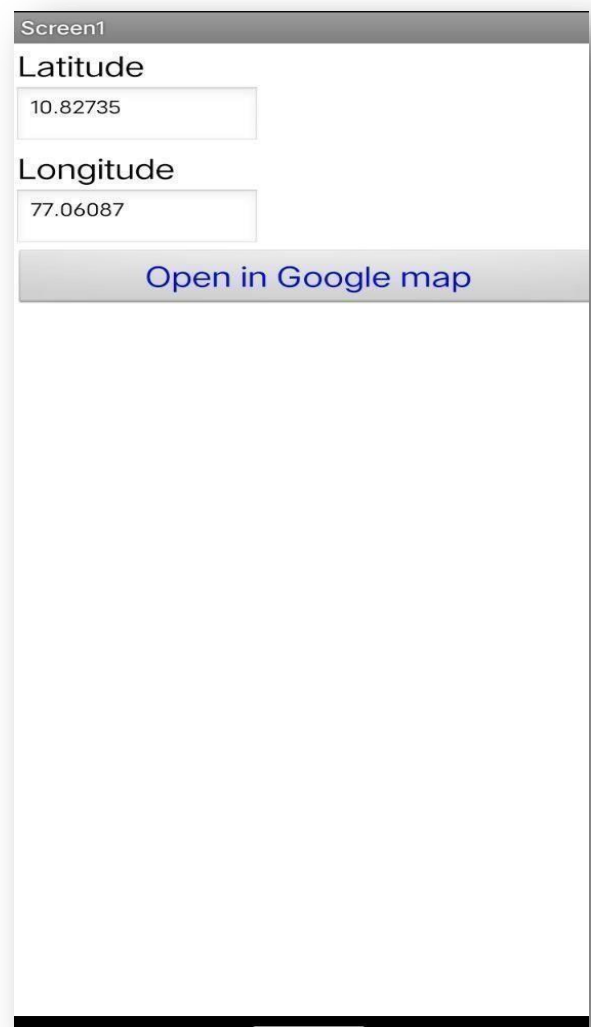


Figure 5.2 Location receiver app

### **Location Updater app**

Location Updater app (Figure 5.1) will update the current latitude and longitude of the device to the firebase. The Location Updater app will fetch the device location and then update the latitude and longitude in the real-time database of firebase.

### **Location Receiver app**

Location Receiver app (Figure 5.2) will receive the last updated latitude and longitude from the firebase. This app will allow you to track the real-time location of buses on a map, helping you to plan your commute more efficiently and minimize wait times at bus stops.

## **CHAPTER 6**

### **CONCLUSION AND FUTURE SCOPE**

The bus navigator project has the potential to revolutionize the way people commute by providing a comprehensive and user-friendly platform for navigating public transportation. The project has already made significant strides in identifying the pain points of commuters and addressing them through its features, such as real-time bus tracking and route optimization.

Looking towards the future, the bus navigator project can continue to improve by incorporating machine learning algorithms for more accurate prediction of bus arrival times and integrating with other forms of transportation like ride-sharing services and bike rentals. Additionally, the project can expand to other cities and regions to provide a seamless commuting experience for people across the country.

Overall, the bus navigator project has the potential to make a significant impact on the transportation industry and improve the lives of millions of commuters.

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