KALASALINGAM
ACADEMY OF RESEARCH AND EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade
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SCHOOL OF COMPUTING

DEPARTMENT OF COMPUTER APPLICATIONS

A Project Report On

BUS IDENTIFICATION DEVICE FOR BLIND PEOPLE

Submitted for partial fulfilment of the requirements for the award of the degree of

MASTER OF COMPUTER APPLICATION

BY

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CERTIFICATE

This is to certify that the project work entitled **"BUS IDENTIFICATION DEVICE FOR BLIND POEPLE"** is a bonafide work carried out by P. Karthikeyan (9923151067), R. Marieswaran (9923151050), R. Ramakrishnan (9923151132), A. Dhetchana moorthy (9923151019), in partial fulfilment of the requirements for the award of degree of MASTER OF COMPUTER APPLICATIONS BY KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION, Krishnankoil, under our guidance and supervision during the year 2023-2024.

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DECLARATION

This is to certify that the work reported in the present project entitled **"BUS IDENTIFICATION DEVICE FOR BLIND POEPLE"** is a record of work done by us in the Department of Computer Applications, Kalasalingam Academy of Research and Education. The reports are based on the project work done entirely by us and not copied from any other source.

Place: Krishnankoil

Date:

Signature of the Students,

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ABSTRACT

This project entitled represents a bus detection system using RFID technology that aims to ease the traveling and movement of blind people the Blind individuals face various challenges when travelling by bus due to the reliance on visual information that is essential for navigation. The "Bus Identification and Location Tracker for Visually Impaired Individuals" project aims to develop a comprehensive assistive technology solution to enhance the mobility and independence of visually impaired individuals in urban environments. The system integrates RFID/NFC technology, GPS tracking, and user-friendly interfaces to provide real-time information about bus identification and location. This innovative device empowers visually impaired individuals to navigate public transportation networks with confidence and ease. Bus stops and routes often rely on visual information such as signs and displays. Blind individuals may have difficult accessing real-time information about bus schedules, routes, and change. Some bus stop may lack proper infrastructure for visually impaired individuals. Knowing when to board or alight the bus can be challenging for blind passenger. Blind individuals may find it difficult to navigate within the bus, especially if there are obstacles or changes in the layout. The proposed system consists of two detection bus identification, one on the buses and the other on the bus transport office. In the bus detection System, the nearby stations will easily detection and then announced through a voice message in the app. Moreover, any existing blind person in the surrounding area of the station will be detected by the bus subsystem to about. The bus driver about the bus route. The app consists of two different applications used, one on the voice assistant app and the other on the Bus details entry app. In the bus detection System, the bus live location will easily detect using GPS module. The bus route is detection using RFID module for blind people. Moreover, In the bus station, the coming buses will be detected and then announced in through a voice message in order to alert the blind people. The Bus details entry app is used for storing the bus route and bus driver details will be stored in database. That details are retrieve from database and then the bus route is showing the voice assistant app. The result show that the system performance is promising in terms of system functionality, safety and cost.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW:

Main concept behind Travelling by bus can be a daunting experience for blind people as they have to rely on assistance from others to ensure they are boarding the correct bus. This can be a time-consuming process and may affect their independence. To address this issue, an embedded system using RFID technology can be implemented to provide bus indication for blind people. The system involves an RFID reader placed at the entrance of the bus and RFID tags given to each passenger. When a passenger enters the bus, the RFID reader reads the tag and sends the information to a microcontroller. The microcontroller then checks if the passenger has boarded the correct bus, and if so, activates a buzzer to alert the passenger. The system also displays the bus number and destination on an LCD display for the passenger's convenience. This system will greatly benefit blind people as they will be able to confidently board the correct bus without relying on assistance from others. It will improve their overall experience and independence while travelling. The following sections will discuss the system in detail and the components used to implement it. creating your proceedings manuscripts. Please follow them properly.

Nowadays, travel has become an important aspect of our life. A normal individual may effortlessly go from one location to another without the need for help. In the case of blind persons, getting from one location to another is difficult since they are primarily dependent on others because they cannot see. It is difficult for blind persons to get to any location in their city using local buses since information about the buses is broadcast on LCD screens at local bus stations. Furthermore, unlike normal individuals who travel alone, blind persons cannot read the bus number to identify the proper bus to board. For this difficulty, we may design a solution by leveraging Internet of Things (IoT). IoT connects gadgets over the internet to behave intelligently and precisely. In the current context, IoT is growing globally, and everyone is using it in their everyday lives to save time and resources. We devised a solution that includes an announcement of the bus details at local bus stations as well as an LED light to alert the bus driver to the presence of blind individuals.

1.2 BLOCK DIAGRAM:

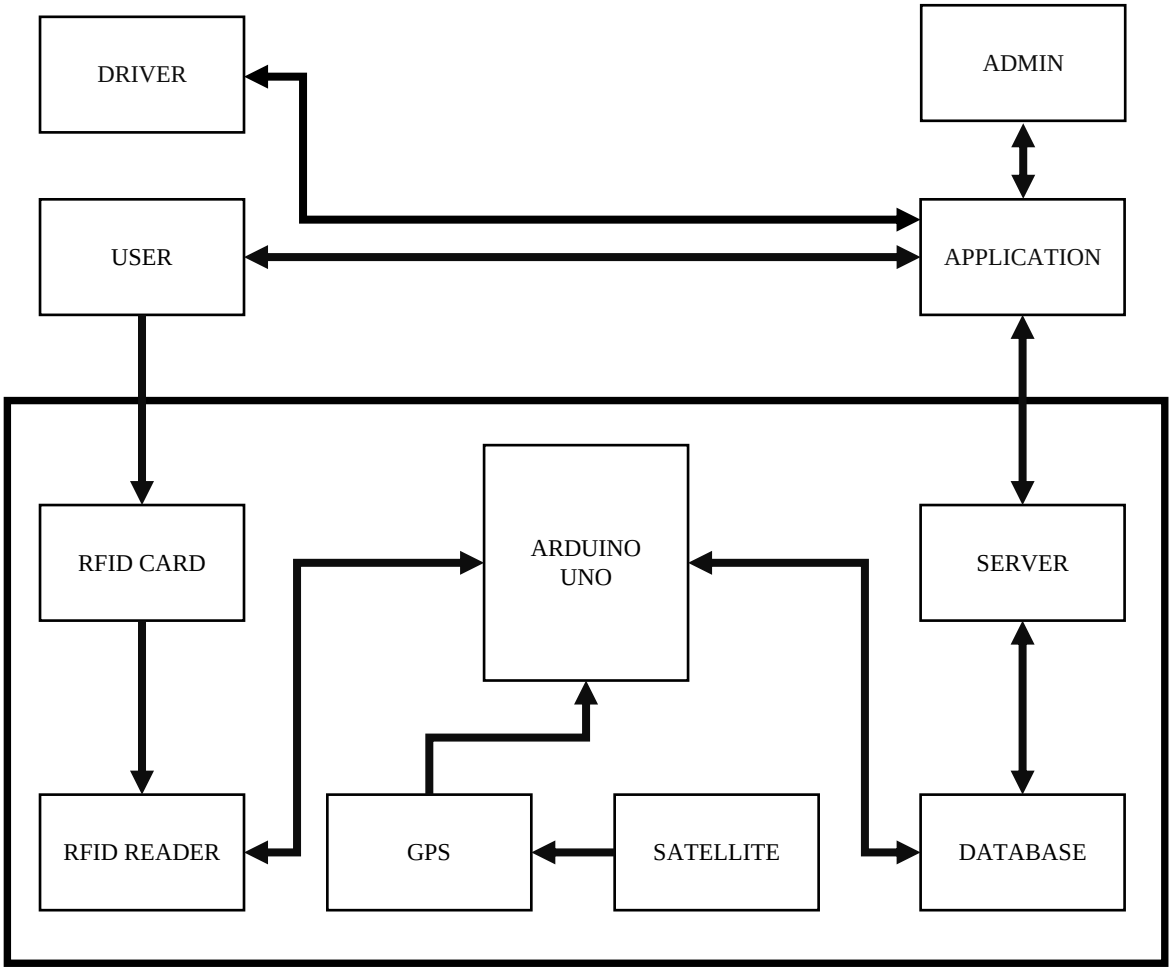

Fig 1.2 Block diagram

CHAPTER 2

SYSTEM ANALYSIS

2.1 EXISTING SYSTEM:

In countries like India, with a huge population focusing on this kind of fancy stuffs are limited. The blind individuals face various challenges when traveling by bus due to the reliance on visual information that is essential for navigation. The blind people are suffering through to travel along the rural to cities previously the project application using RFID is identifying the bus only. It does not return any details of the bus neither any detailed information. They cannot know the bus is going to their desired destination.

2.2 PROPOSED SYSTEM:

The proposed system consists of two detection bus identification, one on the buses and the other on the bus transport office. In the bus detection System, the nearby stations will easily detection and then announced through a voice message in the app. Moreover, any existing blind person in the surrounding area of the station will be detected by the bus subsystem to about. The bus driver about the bus route. The app consists of two different applications used, one on the voice assistant app and the other on the Bus details entry app. In the bus detection System, the bus live location will easily detect using GPS module. The bus route is detection using RFID module for blind people. Moreover, In the bus station, the coming buses will be detected and then announced in through a voice message in order to alert the blind people. The Bus details entry app is used for storing the bus route and bus driver details will be stored in database. That details are retrieve from database and then the bus route is showing the voice assistant app. The result show that the system performance is promising in terms of system functionality, safety and cost.

2.2.1 FEATURES:

- Improved accessibility
- Real-time information
- Easy to use
- Cost-effective
- Scalability

CHAPTER 3

SYSTEM SPECIFICATION

3.1 HARDWARE REQUIREMENTS:

S.NO	COMPONENT'S NAME	DESCRIPTION	QUANTITY
1.	Arduino	UNO Board	1
2.	RFID Module	RFID-RC522 Module	1
3.	Jumper Wires	male to Female jumper wires	10
4.	GPS	NEO – 6M Module	1
5.	Solderless bread board	Bread board half	1

Table 3.1 Hardware requirements

3.1.1 MODULE'S LIST:

- Create the voice assistant app,
- Create a Backend/API using a Flask the API,
- Database configuration in MongoDB,
- GPS location tracking,
- Integration with Bus schedule retrieval using RFID.

3.1.2 ARDUINO UNO:

The Arduino UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family. Fig 3.1.2 Arduino UNO Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input / output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a AC-to-DC adapter or battery to get started.

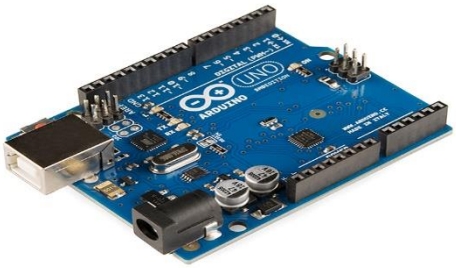

Fig 3.1.2 Arduino UNO

3.1.3 RFID MODULES:

A radio frequency identification reader (RFID reader) is a device used to gather information from a tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. Connect the RFID reader to your system and configure it to read RFID tags/cards. Fig 3.1.3 RFID tags/cards When a tag is scanned, capture the unique identifier (UID) or associated data. If the RFID tag contains passenger data, associate that UID with specific information (e.g., ticket type, destination, etc.) in your MongoDB database. If the RFID contains bus pass information, associate it with the relevant bus schedule or route in your database. Use the UID or associated data from the RFID tag to query your database. Retrieve the relevant bus schedule or details associated with that RFID tag.

Fig 3.1.3 RFID tags/cards

3.1.4 GPS MODULES:

Describe the purpose of the module for retrieving live location using GPS. Mention the geolocator package as a dependency. Fig 3.1.4 GPS Modules Provide a code snippet demonstrating how to use the Geolocator methods for location retrieval. Explain the handling of location permissions and how the app requests and handles user consent for location access. By understanding and implanting GPS functionality using packages like geolocator in Flutter,

developers can access and utilize the device's location data within their apps for various location-based functionalities, such as mapping, navigation, location-aware services and more.

Fig 3.1.4 GPS Modules

3.2 SOFTWERE REQUIREMENTS:

S.NO	COMPONENT'S NAME	DESCRIPTION
1.	Arduino IDE	Writing and compiling the code
2.	Firebase	Reading, writing, updating, or deleting documents
3.	Voice Assistant	Speech-to-speech functionality
4.	MongoDB	Communicate with the backend mongodb database

Table 3.2 Software requirements

3.2.1 ARDUINO IDE:

Arduino IDE is open-source software that is mainly used for writing and compiling the code into the Arduino Module. It is official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment. A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more. Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code. The main

code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module. This environment supports both C and C++ languages.

3.2.2 FIREBASE:

Use Firestore's API to perform document-related operations, such as reading, writing, updating, or deleting documents in your Firebase Firestore database. Integrate Firestore API calls within your document module to handle specific document-related functionalities. For instance, you might create, update or fetch documents based on user actions within your app's document module.

3.2.3 VOICE ASSISTANT:

Implement voice recognition using Flutter's speech recognition packages like speech_to_speech or flutter_tts for speech-to-speech functionality. Fig 3.2.3 Voice assistant app Design the app UI to prompt and to audibly convey retrieved information. The basic implementation allows you to start/stop voice recognition. Customize and expand these functionalities based on your specific use case, like integrating the recognized words with bus schedule retrieval or RFID functionality in your app.

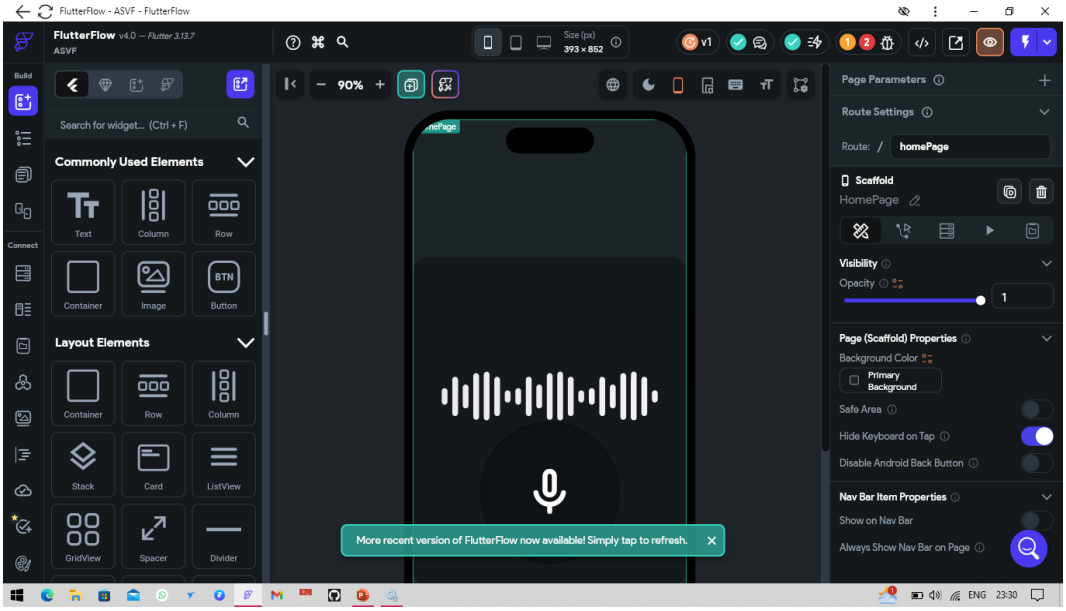

Fig 3.2.3 Voice assistant app

3.2.4 MONGODB:

Create a MongoDB collection for bus schedules. Each document could represent bus route, containing fields like route name, schedule, stops, times, etc. Fig 3.2.4 MongoDB Develop RESTful APIs (using libraries like Dio or http package) to communicate with the backend MongoDB database. Use MongoDB store bus schedules. Handle CRUD operations (Create, Read, Update, Delete) to manage schedule data.

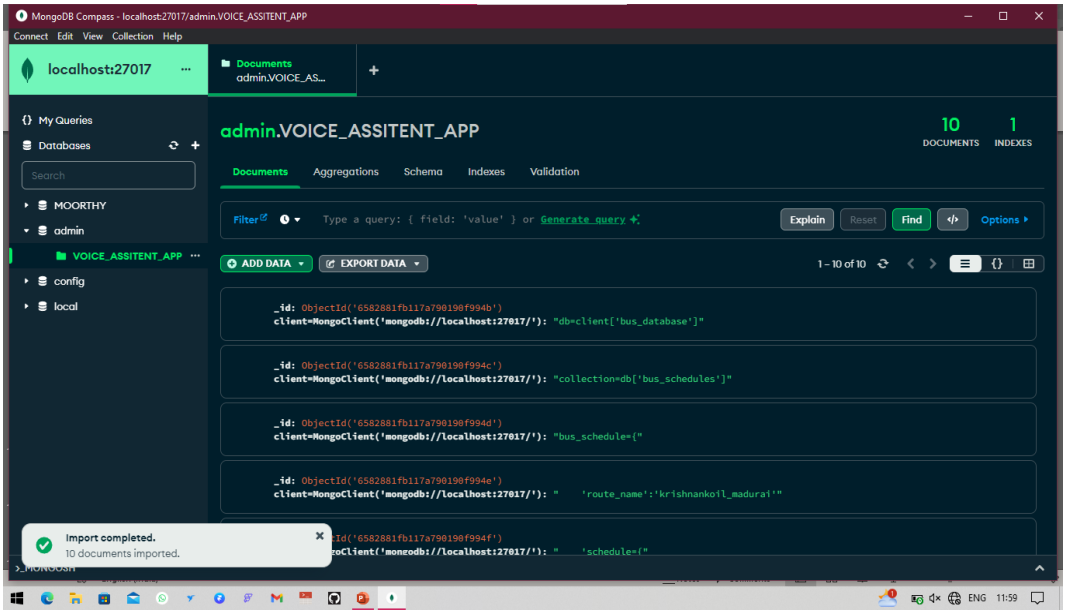

Fig 3.2.4 MongoDB

CHAPTER 4

SYSTEM DESIGN AND DEVELOPMENT

4.1 USECASE DIAGRAM:

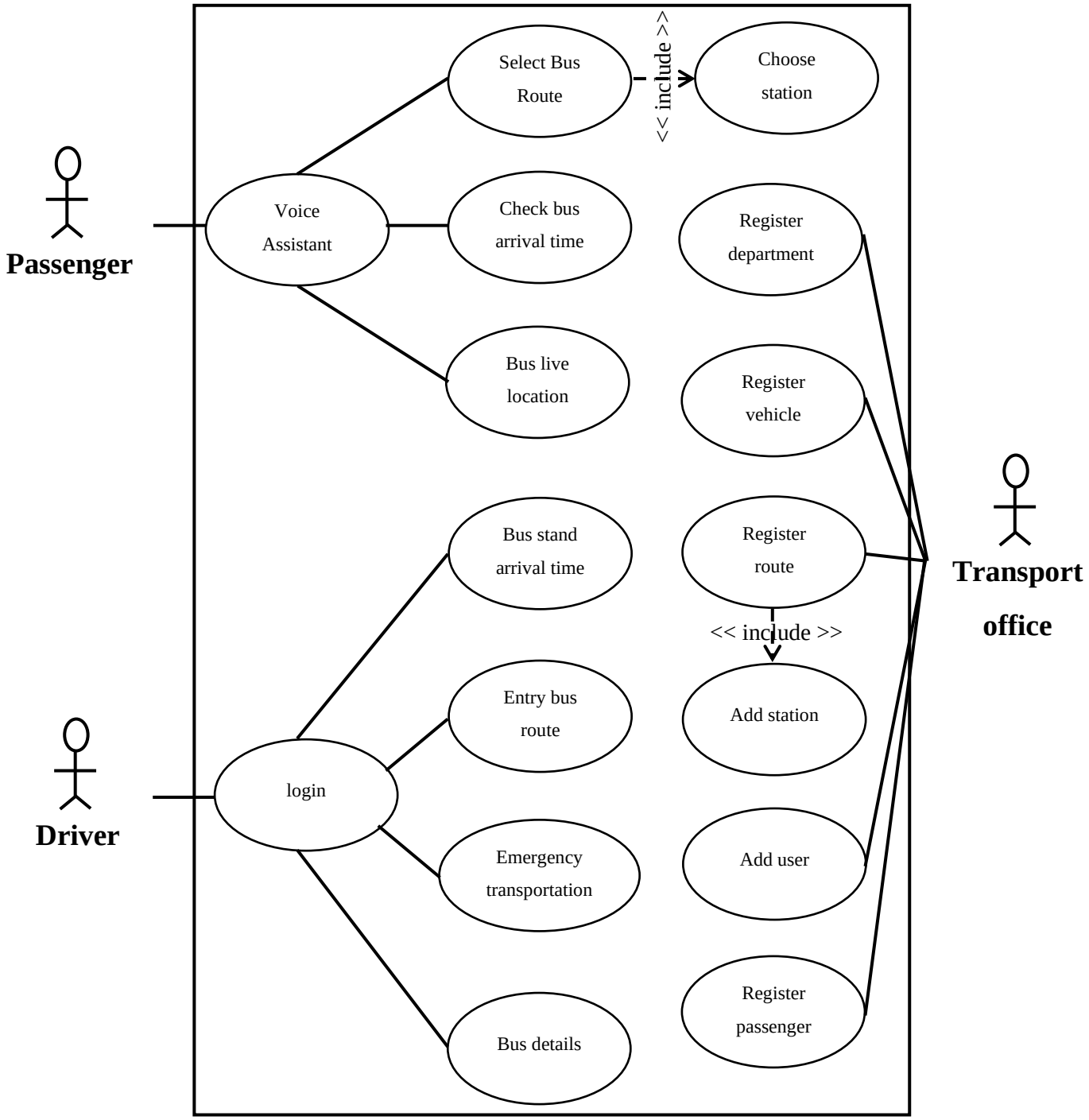

Fig 4.1 Use case diagram

4.2 DATAFLOW DI\AGRAM:

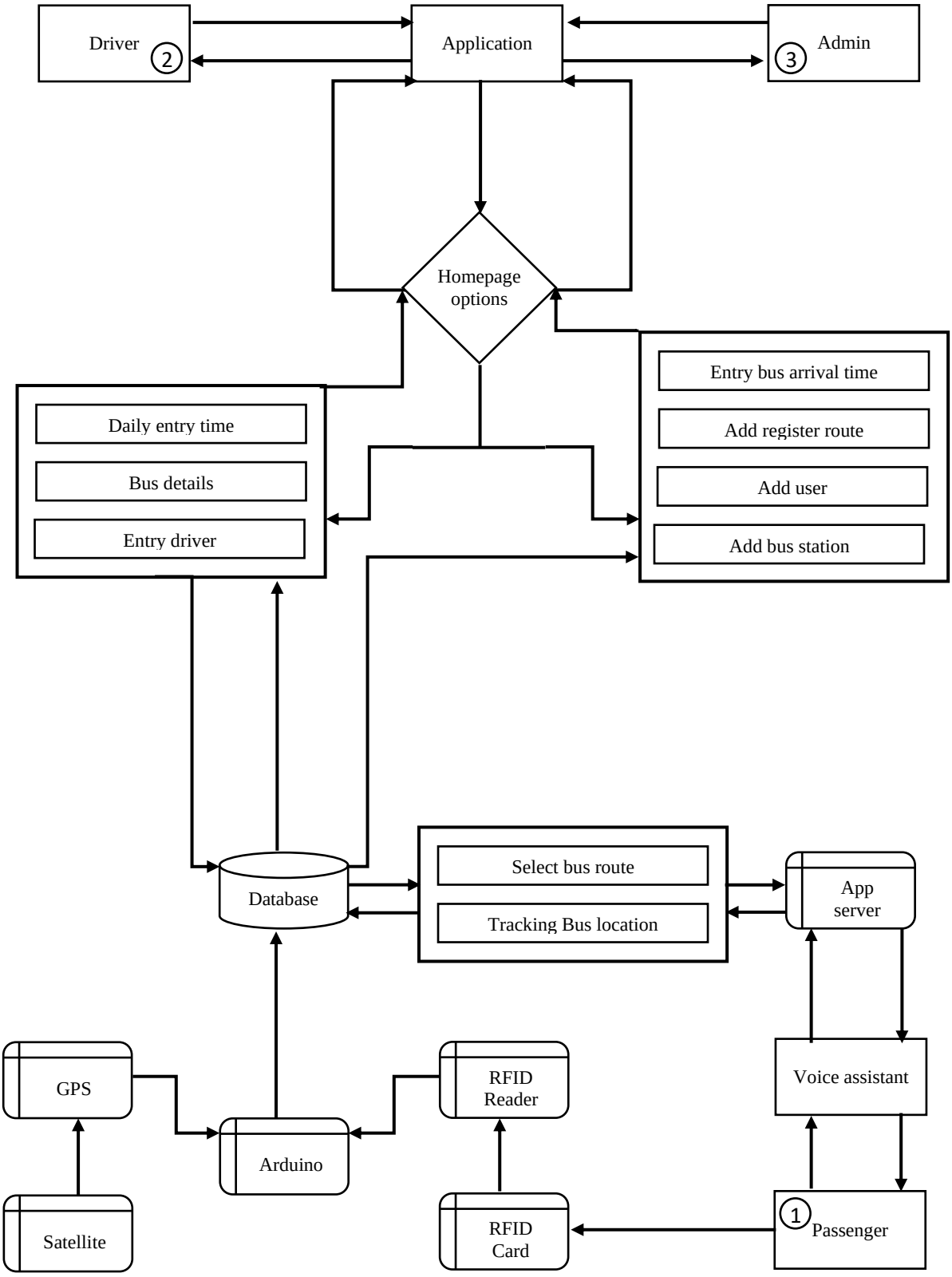

Fig 4.2 Dataflow diagram

4.3 DATABASE DIAGRAM:

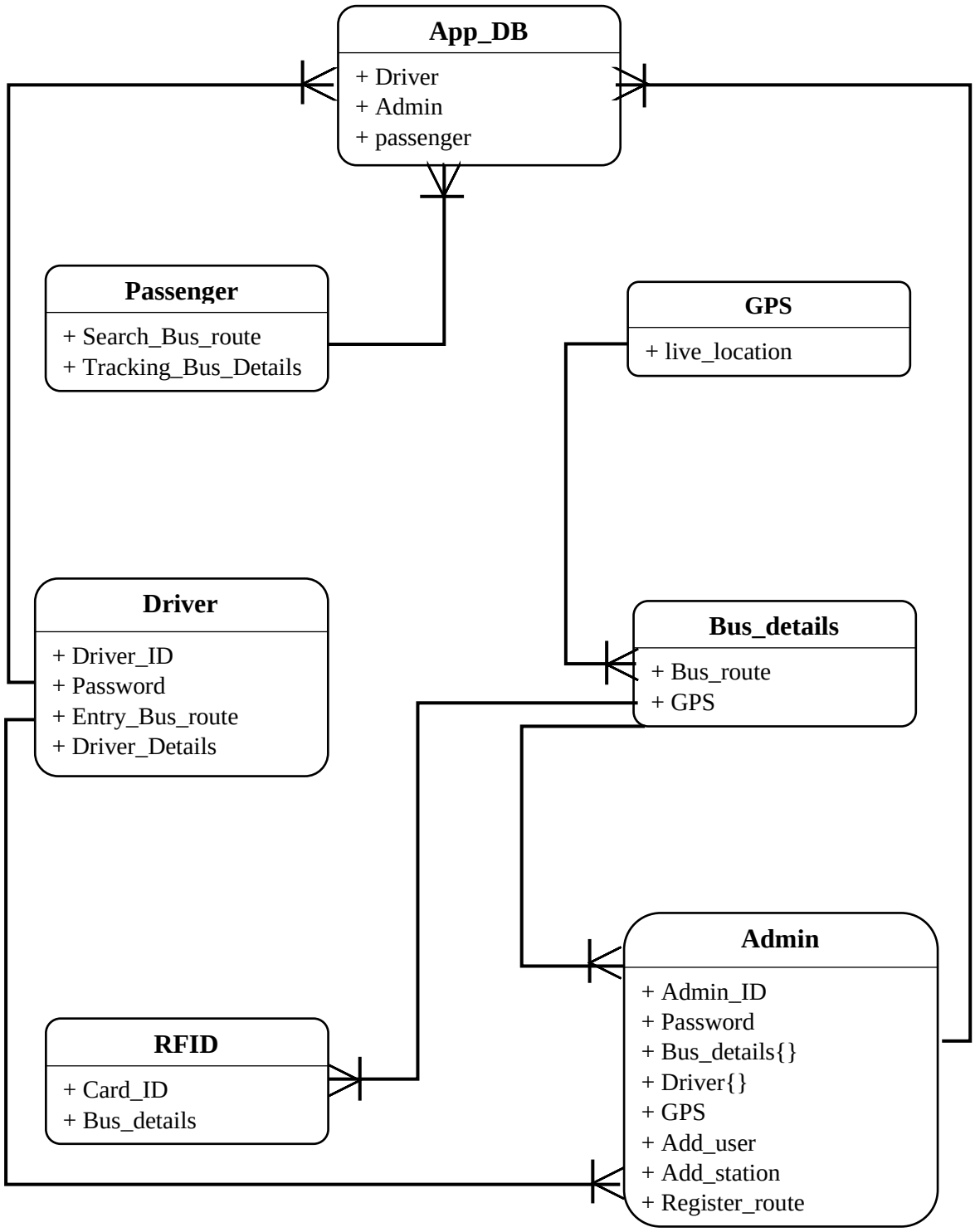

Fig 4.3 Database diagram

CHAPTER 5

SYSTEM TESTING

5.1 INTRODUCTION:

Testing a process used to help identify the correctness, completeness and quality of developed computer software. Testing can never completely establish the correctness of the computer software. Instead, it furnishes a criticism or comparison that compares the state and the behavior of the product against oracles principles or mechanism by which someone might recognize a problem. These oracles may include (but not limited to) specifications, comparable products, past versions of the same product. inferences about intended or expected purpose, user or customer expectations, relevant standards, applicable laws, or other criteria. Over its existence, computer software has continued to grow in complexity and size. Every software product has a target audience. For example, the audience for video game software is completely different from banking software. Therefore, when an organization develops or otherwise invests in a software product, it presumably must assess whether the software product will be acceptable to its end users, its target audience, its purchasers, and other stakeholders. Software testing is the process of attempting to make this assessment.

5.2 TESTING TECHNIQUES:

Testing involves operation of a system or application under controlled conditions and evaluating the results. The controlled conditions should include both normal and abnormal conditions. Different phases of testing are described along with the level of testing incorporated in this project. System Testing is a crucial element of software quality assurance and represents the review of the specification. The user tests the developed system and changes are made according to their needs. The testing phase involved the developed system using kinds of data. System testing refers to the process of executing a program with the intention of finding errors i.e. executing the software with data to ensure that the software works correctly.

System testing is the stage of implementation that is aimed at assuring that the system works accurately before live operation commences. Testing is the vital to the success of the system. System testing makes a logical assumption that if all parts of the system are correct. the goal will be successfully achieved. After completing the design and code review of the application block, it is needed to test the application block to make sure it meets the functional

requirements and successfully implements the functionality for the usage scenarios it was designed and implemented for Several modules constitute a project. If the project is long-term project, several developers write the modules. Once all the modules are integrated, several errors may arise. The testing done at this stage is called system test.

5.2.1 UNIT TESTING:

The first test in the development process is the Unit Test. The source code is normally divided into modules, which in turn are divided into smaller units called units. These units have specific behaviours. The test done on these units of code is called unit test. Unit test depends upon the language on which the project is developed. Unit tests ensure that each unique path of the project performs accurately to the documented specifications and contains clearly defined inputs and expected results. In the SMS Based Remote Device Controller each and every unit of the code is tested. All the errors that occurred during the testing phase, has been cleared and the final system is error free.

5.2.2 INTEGRATION TESTING:

Integration testing is a systematic technique for constructing the program structure, while at the same time conducting tests to uncover error associated with interfacing. In integration testing the individual tested units are grouped as one and the interface between them is tested. Integration testing identifies the problems that occur when the individual units are combined. The top-down integration strategy verifies major control or decision points. This test is used in our project to get the interactive input without error. The bottom-up integration testing is used to test the components from lower level. This test is used to reduce the error. In this project the modules are integrated to build the system. This integrated system is conducted to see that the flow is correct from module to module.

5.2.3 USER ACCEPTANCE:

It is a black-box testing process where the functionality is verified to ensure the software product meets the acceptance criteria. Acceptance testing is a software testing approach where the system is tested for acceptability. It’s the last phase of the software testing process, and it’s important before making the software available for actual use.

CHAPTER 6

CONCLUSION & FUTURE ENHANCEMENT

6.1 CONCLUSION:

There are an estimated 40 to 45 million blind people worldwide; particular services need be provided to them in order for them to live like others do. In this study, we developed an RFID-based bus detecting system for blind people. The proposed system is simple to use and benefits all passengers, not just those who are blind. The system's two subsystems are the bus subsystem and the station subsystem. The bus subsystem alerts all passengers of the forthcoming stops on the bus route. Additionally, the number of blind people who use the bus as well as their destinations will be communicated to the bus driver. The announcement will be made by the station's subsystem. This study is primarily concerned with making it easier for blind individuals to board buses. Our key premise was that every blind person may go to anywhere at any time. The "BUS IDENTIFICATION FOR BLIND PEOPLE" is designed to provide bus information to blind persons. It activates when the RFID reader identifies the RFID tag and serially communicates the tag id to the Arduino UNO board. It validates the tag id and provides it in array format to the Raspberry Pi. The bus information on the Raspberry Pi is turned into speech using the Speak package, and a voice announcement is made via a speaker at the bus stop. The top right led light at the bus stop will turn on when an Infrared sensor detects the presence of blind persons, alerting the driver of their presence.

6.2 FUTURE ENHANCEMENT:

While the current system utilizes RFID technology for bus identification, there exists an opportunity to enhance the system's capabilities by integrating machine learning algorithms. This enhancement aims to provide more robust and versatile identification capabilities beyond RFID tags. Integrating machine learning-based bus identification presents a significant opportunity to enhance the system's capabilities, providing more robust and versatile bus identification functionalities beyond the current RFID technology. Remember to tailor the document based on your specific project's context, highlighting the potential benefits, challenges, and considerations associated with integrating machine learning for bus identification as a future enhancement.

CHAPTER 7

APPENDICES

7.1 SAMPLE CODING (DATABASE):

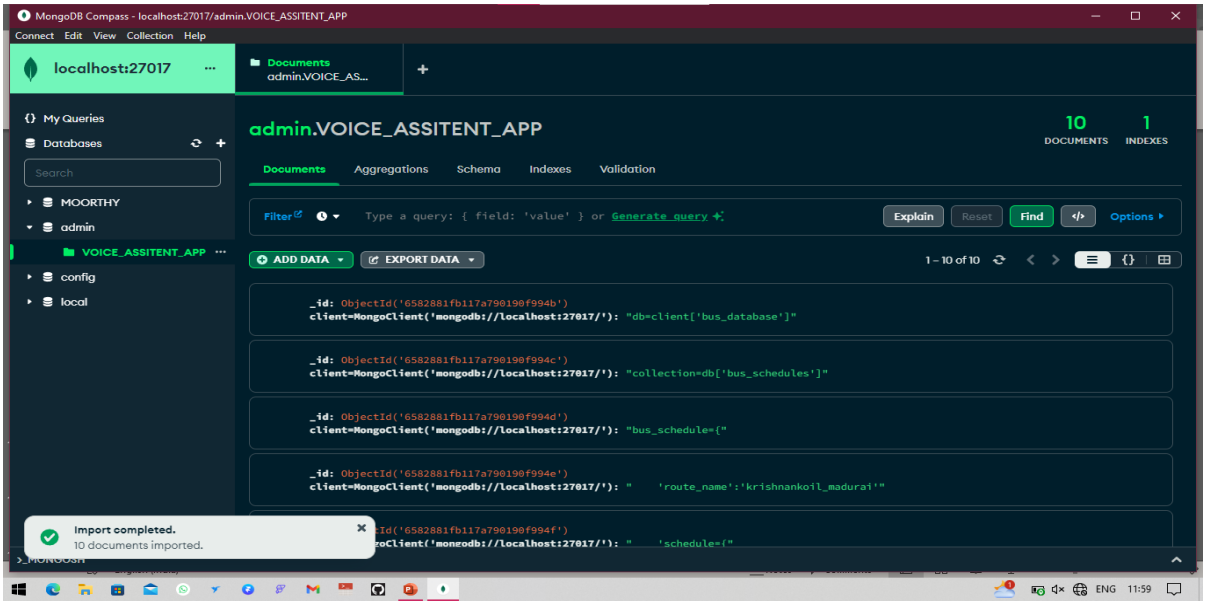

Fig 6.2.1 Sample coding (database)

7.2 SAMPLE SCREENSHOTS:

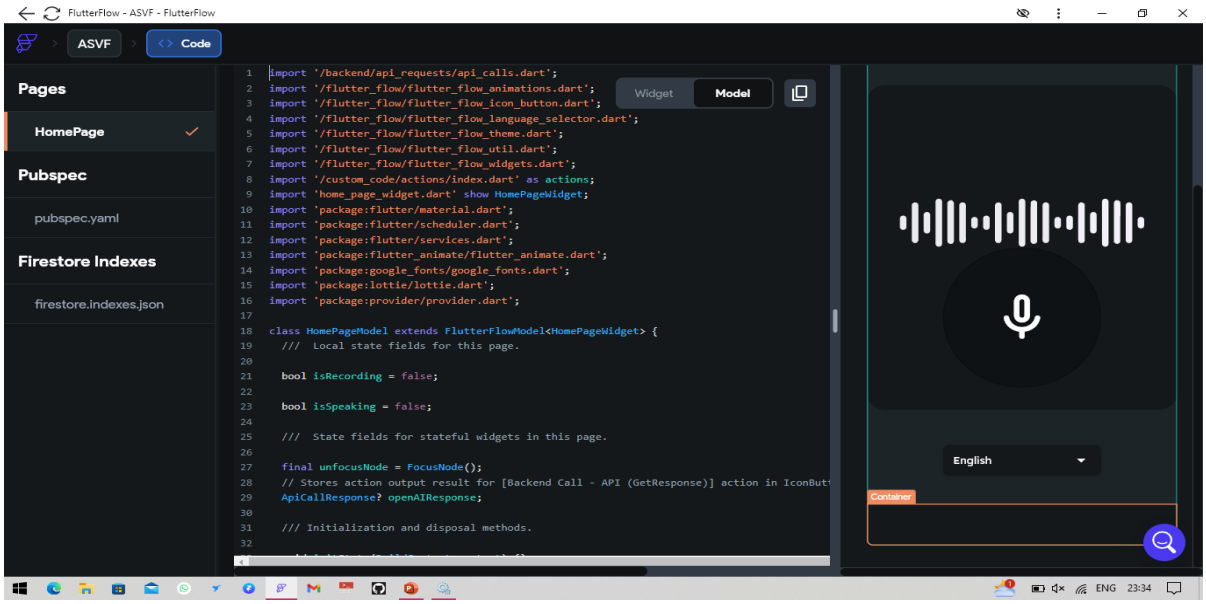

Fig 6.2.1 Sample screenshots

CHAPTER 8

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8.2 WEBSITES:

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