Conductorless Passenger Analaysis and Driver Alert System

Aarcha Thrideep[1] , Aleena I Jijo[2] , Krishnendu Jeevan[3], Vijisha Vijayan[4], Jyothi Johnson[5]
[1] *Systems Engineer, Quest Global*
[234]*Associate Engineer, OSPYN Technologies*
[5] *Asst. Professor, Marian Engineering College, APJ Kerala Technological University, India*

***Abstract* - Every element of life is influenced by the public transit system. It has a stronger impact on the country's economic progress. This system's key issues include tracking, monitoring, scheduling, and alert services. Currently, the system's key services are manually handled, resulting in erratic results and denying consumers easy access. The intervention of a conductor is eliminated using QR Code. The goal of this project is to automate the services of a web portal that can provide real-time monitoring of public transportation buses. The buses will have IR sensors installed in stairs to count the passengers. For accident detection, a vibration detection sensor is also mounted on the front side. The central controller for this system is an Arduino board. For continuous monitoring, the Wi-Fi module will be utilized to send messages to authorized persons. The location of the buses is determined using Global Positioning System (GPS). IoT will provide users with bus status information as notifications in their systems.**

***Index Terms* – QR code, Web portal, IR sensor, WiFi module Global Positioning System(GPS), IoT.**

I.INTRODUCTION

The explosive rise of the Internet of Things (IOT) has caused a major disruption in the lives of students, particularly in their educational and learning environments. Human beings in good sized shipping framework presents a protected and comfortable transportation for vacationers. The precept goal of our task is to decorate the convenience of use and performance of the modern transportation framework in India which must be viable utilising IOT innovation[1]. When a mode of transportation is available, it may not have enough capacity to accommodate everyone. As a result, buses are a popular mode of public transportation. The bus tracking system is a technology that not only tracks the bus but also informs passengers about the bus's availability. This method can be used in public and private bus services, as well as in schools and universities. Because so many students take buses to school and college, it can be utilized to track students for the convenience of guardians and parents, as well as for student safety.

This project proposes a Web application that employs QR codes to accomplish ticket booking in buses without the use of a bus conductor. Passengers scan the QR code before entering the bus, making illegal behaviour impossible. The Global Positioning System (GPS) is utilised to track the bus's location, while IR (Infrared) sensors are employed to count the number of passengers. Users can utilise the web application to track the whereabouts of the bus. The project's ultimate goal is to establish a centralised web system that leverages IoT to track available buses along the route. Each passenger's identity is stored in the system. With the help of a vibration sensor, the authorised department can track the speed.

The rest of the paper is organized as follows. The literature survey on various bus transportation methodologies is discussed in section II. The section III provides proposed system architecture. Methodology and System Design is elaborated in section IV. Experimental results and Discussion are included in section V. Conclusion is discussed in VI section.

II.LITERATURE REVIEW

Many researches are carried out related to IoT Based Bus System. In 2020 Mona Kumari et.al.[2] proposed a system. It was an android based IOT application

which facilitates people to track real time location of bus using raspberry pi controller. The people will be provided with an Android app where they can register their details like username, email-id, password and mobile number. After the process of registration, users can login into their profile. After login, it will notify the number of buses on that particular route along with number of vacant seats available. A RFID system is connected with the raspberry pi, GSM and GPS module to notify the location and updated count of passengers in the bus. An updated count of passengers refers to the traffic in that area that facilitates the administrator to increase or decrease the bus services in that area. This system can also be implemented in school buses which helps the parents to check the real time location of their child in the bus.

Meet J Shah et.al.[3] proposed an IoT based smart bus system. In this system, each user will be issued with an RFID card which will contain a unique RFID number. User has to register on the SBUS app with this unique RFID number. All the user's details will be associated with this unique RFID number and stored in the database through Sbus app. An SIM808 GPS GSM Module is installed on each bus. This module will fetch the latitude and longitude of the bus and update it in the database. Thus database will consist of the bus number and its current location. When the passenger enters or exit the bus he/she has to tap the RFID card on this RFID readers, When the user taps their RFID card on this RFID readers, their source and destination location is updated in the database and based on the distance, fare is deducted from their e-wallet.

I Gede Susrama Mas Diyasa et.al.[4] proposed a Smart Passenger Information System Based On IoT. This system uses Wemos D1 Mini (IoT), RFID and its accessories, GPS modules, computers and cellular phones. Wemos d1 mini was used as the main controller of the system, namely as a medium for sending data on the number of passengers who get off, get on, and the ones who are on the bus, while the GPS module was used to get the bus position when it stops at a bus stop. RFID Card and Reader were used as input devices for the number of passengers who get on and off, and the ones who are on the bus. The LCD display was used to display the number of passengers who get off, get on, and the ones who are on the bus. All modules and components were controlled and coordinated by the microcontroller system and software on the bus management server in the form of a dashboard display and an Android-based cellular phone display.

While the transportation services are adequate, a major problem is the lack of information to meet the passenger's needs in these modern times. There is also a general dissent among the public in using public transportation services. People would prefer the public transportation to be scheduled properly, on time and the frequency be increased for commuters to make good use of it.[5]

From the above reviews, it can be concluded that there is a need for a full-fledged web portal where all the needs of a passenger can be met. Our system proposes a cost-efficient technique for booking tickets, tracking the bus, issue of bus tickets containing QR code without the intervention of a conductor.

A. Existing System

Normally, the conductor issues the ticket using a ticket printing machine or by hand, and it is quite difficult to provide the balance for each passenger. Passengers are unable to identify impending buses, seat availability, and other information. As a result, the public does not make proper use of the KSRTC's services. Currently, some buses are quite crowded, while others have a limited number of passengers. As a result, the majority of passengers attempt to board the first bus. The current bus system does not adhere to the correct schedule, so passengers are unaware of bus schedules. The current system does not maintain track of the traveler's information. It's tough to recall the number of passengers that want to depart from a specific stop. Because the current method does not give sufficient protection, the authorities are unable to identify the person in the event of a problem, such as theft or misbehaviour.

III.PROPOSED SYSTEM

The proposed system gives long-distance public transportation a new look. Every passenger receives a card with a QR code. The card includes the passenger's information as well as a photo. It may be recharged through the internet. When guests scan the QR code,

the system saves their information, which is extremely useful for future usage. If there is an issue, such as theft or misconduct, it is simple to understand the person. As a result, this technology provides increased security. It is relatively simple to obtain information on passengers on a specific bus, so in the event of a road accident, we can quickly locate the accident victims.

Passengers at the bus stop may see which buses are coming up, how many seats are available, and so on. The technology automatically updates the availability of seats at each stop. If the first bus is overcrowded, they will be able to estimate the time to the following bus. Conductors' workload is reduced by the system. The conductor will obtain a list of passengers who will disembark from the vehicle at a specific stop.

A. Problem Identification

The lack of a proper bus tracking system is one of major issues recognised in existing bus system. Passengers will have to wait for the bus for an extended period of time. The existing paper-based ticketing system is inefficient and inconvenient for passengers, it wastes a great deal of paper every day. The present transportation system has several flaws, including passenger overcrowding, a high danger of accidents, and an increased risk of infectious disease spread. The count of the money received from the passengers is a terrible duty for the Depot workers at the end of the day. [6]

B. Working

The block diagram of the system is shown in Figure 1. The Arduino Mega 2560 microcontroller board is used in the construction of a smart bus monitoring system. Arduino mega[7] is the system's central controller. All activities, such as retrieving the GPS module's latitude and longitude coordinates are sent using a Wi-Fi chip on the server.

Here, a vibration sensor is used to detect impacts or accidents. The microcontroller continuously monitors the sensor's output reading. If there any impact detected, controller will be immediately triggered and Convey an alert to the server.

The information regarding latitude and longitude of the vehicle is captured using GPS module. The GPS module has the GPS receiver with antenna[8]. GPS module communicates continuously with the satellite for getting coordinates.

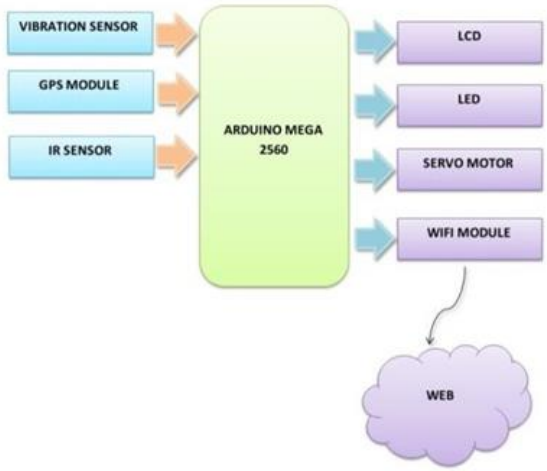

Fig. 1. Architecture

Then these coordinates from GPS will be send to Arduino using UART. And then Arduino extract the required data from received data by GPS. Before this, Arduino sends command to Wi-Fi Module ESP8266 for configuring & connecting to the router and getting the IP address. After this, Arduino initialize GPS for getting coordinates and send them to the server via ESP8266 module. Thus the current location of the bus will be available to the users.

LCD is used for user interface, shows all the details like location, passenger count and accident details. When the controller gives the data in ASCII form to the LCD, it will display the corresponding characters. Also RGB LED indications are provided for accident alert and passenger movement detection through the doors.

Door is controlled by servo motors for automatic function. Servo rotate according to the signal from Arduino. The bi-directional IR sensors[9] are fitted on the door of every bus .It detects the entry or exit of the passenger . When the power supply is given to IR sensors the module will start, once the supply is given, it will start to sense the motion in IR using the phenomenon of infrared to detect the motion. Once the IR detects the motion it gives the output.

The ESP8266 Wi-Fi module is a self-contained SoC with integrated TCP/IP protocol stack that can give any microcontroller access to the Wi-Fi network. The

ESP8266 module is not capable of 5v power and will require an external power converter to 3,3v. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP / IP Connections.

IV.METHODOLOGY

An Apache web server hosts the complete system. The MySQL database is automatically updated with data from the IoT device (through the wifi module). After successfully logging into the portal, each functional module has access to the database.

A. Technology Used

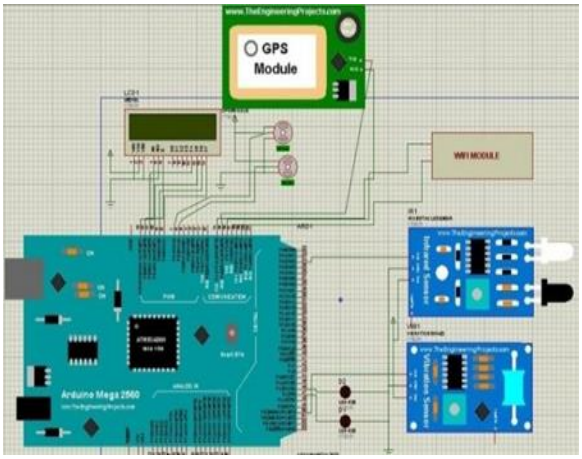

Fig. 2. Circuit Diagram

Depending on the programme, an Arduino mega microcontroller board is utilised to control the system. The Arduino Mega 2560 was utilised in this project. The Arduino IDE is used to programme the board, which is done in Embedded C. A 16*2 Liquid Crystal Display is used to publish information that gives the driver with information about the passengers. In order to track a vehicle in real time, the application uses Google Global Positioning System (GPS) API to get longitude and latitude of the vehicle as an object.[10] It also has the ability to detect speed and time. GPS will provide current location information to the controller board. Passengers' movement through doors is detected using an infrared sensor. The vibration sensor detects collision or vibration, both of which signal an accident. The microprocessor sends a signal to the servo, which controls the door's movement. The servo motor can be rotated at a specific angle by the microcontroller. This system's WIFI module allows for wireless connection.

B. Implementation Details

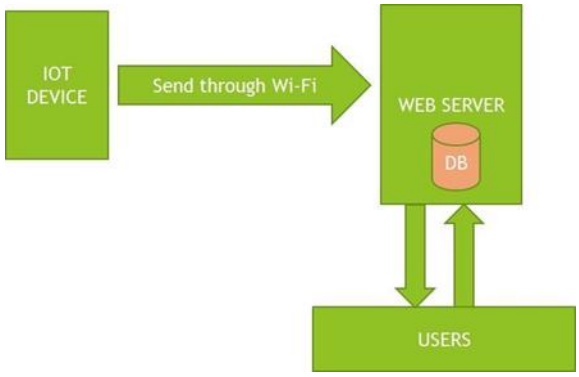

Fig. 3. System Design

This project's web portal was created utilizing HTML, CSS, and PHP, among other technologies. The UI is designed using HTML, CSS, Bootstrap, and JavaScript. PHP is a scripting language that is utilised on the server. The database backend is MySQLi. PHP's default backend is MySql. The above-mentioned technologies are used to build the full web portal. Figure 3 depicts the operation of this system.

An Apache web server hosts the complete system. The MySQL database is automatically updated with data from the IoT device (through the wifi module). After successfully logging into the portal, each functional module has access to the database.

V.RESULT AND DISCUSSION

A. Result

Table 1 shows the details of our work. The steps, data, expected results and the testing details of the specified scenarios are mentioned

ID	Scenario	Steps	Data	Expected Results	Received	Pass/ Fail
1	Admin Login with correct data	1.Open URL 2.Enter User-ID and Password 3.Click the Login Button	Admin for both username and password	Successful Login	Login Done	Passed
2	Fill the details to register a user	1.Open URL 2.Fill all mandatory data in correct format.	Give all valid data in all fields	Registration successful	Registration done	Passed

		3. Click to register				
3	User registration	1.Open URL 2.Fill all mandatory data in incorrect format. 3.Click to register	Give incorrect details to all field	Showing error messages	Registration failed	Passed
4	IOT Details	1. Start device 2. Connect with internet	Data send via Wifi Module	Store to DB	Stored successfully	Passed

Table 1 : Testing details

The authentication is tested effectively and only valid users can login to this portal . Data store is correctly populated as and when required. Block creations are under control. The application is working properly without any error and the concerned users can use the application effectively.

Fig. 4. Ticket Booking Page

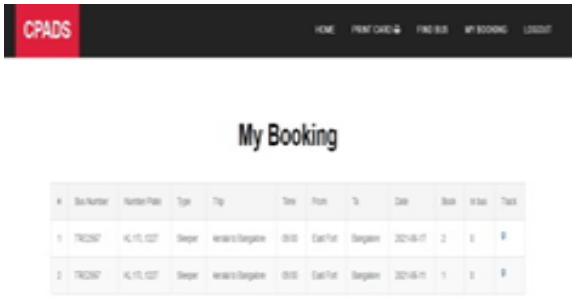

Fig. 5. Booking details and Tracking Page

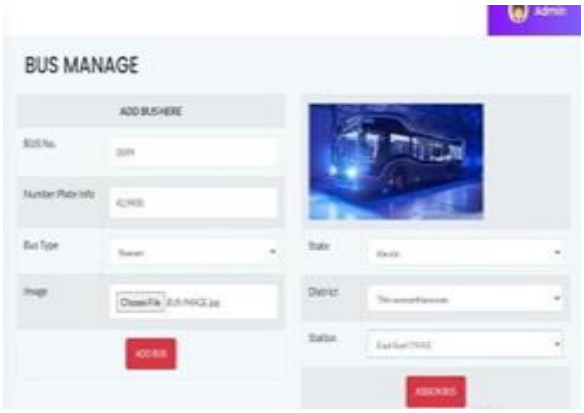

Fig. 6. Bus Manage Page

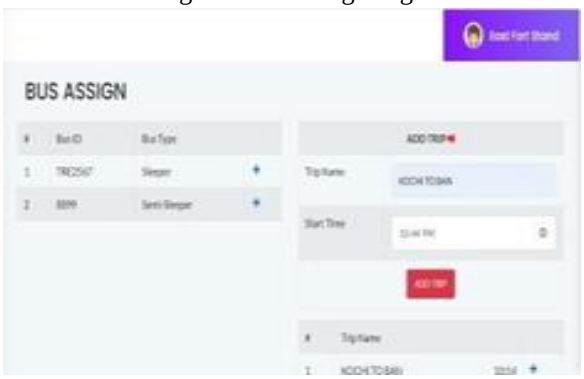

Fig. 7. Bus Assign Page

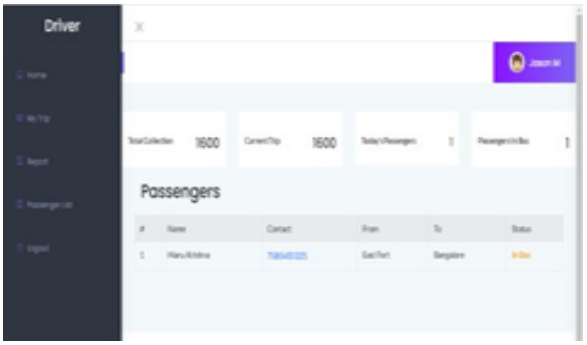

Fig. 9. Driver Management Page

Fig. 10. Accident Report

This technology relies heavily on GPS. Installing a GPS module in this project has additional benefits. The whereabouts of the bus can be easily traced and monitored in this project thanks to the use of GPS. Using GPS does not extend the range.

With the Internet of Things, communication between the embedded control unit and the remote control unit is simple. The location and navigation of the bus are constantly monitored. The bus's real-time tracking ensures that the speed control and accident monitoring systems are in place. As a result, if the bus driver speeds or causes an accident, the authorities will be notified. It ensures that the bus is properly managed. It also cuts down on the amount of time spent in an unlawful location. It has a cheap operating cost and a high output rate. The bus can be tracked indefinitely, even across large distances, thanks to GPS, which delivers a better result. This system provides the safest and most convenient mode of transportation.

Fig. 11. IoT Bus Model

Fig. 12. Upper view of the model

B. Discussion

To address some of the issues in the current transportation system, the implementation of conductor-less passenger analysis and a driver alert system is proposed. The system is powered by IoT devices and administered using a web application built with PHP as the server side language and MySQL as the backend. HTML and CSS are used to create the user interface. We use the technology bootstrap to make the portal mobile responsive. We use the XAMPP server to set up PHP, Apache, and MySQL.

Users are categorized in the web section of the system. The system's most powerful user is Administrator. Each user has their own user id and password to access the site. Each user receives the desired output from the system.

Table. 2. Comparison of existing and proposed system

VI.CONCLUSION

Each user's identification is recorded in the system. With the use of IOT, authorized departments can monitor the bus's speed and passenger count. With the use of QR codes, the system can issue tickets without a conductor. This project developed an Internet of Things (IoT)-based system to manage a bus system without a conductor. The web server stores the IOT-updated bus information, which can be managed by approved modules. The app is built in a modular manner. All relevant input validations were completed successfully and to everyone's satisfaction. As a result, the system has met all of its objectives and is ready to take over from the current system. The technology is incredibly versatile and efficient, making client interactions straightforward. The required speed and accuracy are maintained. Without losing any data, the data entered in a specific format. In the future, this project can be modified to meet the needs of the moment, and further modules can be added. Both passengers and the public transit system will benefit greatly from this investment.

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