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Smart Bus Management System

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ABSTRACT: It is observed that the passengers waiting at the bus stop for the bus often are less aware of the location of the bus, the same problem is faced by the passengers sitting on the bus also. In such conditions asking the bus conductor about the position of the bus might not be always convenient. There can be a situation when the bus is overcrowded and we are unaware of the proper location of the bus. There are many situations when bus drivers need to connect with the conductor but due to overfilling of the bus, he/she might not be able to communicate. So in our project, we have implemented a proposed solution to eliminate these problems faced by passengers sitting in a bus and also by passengers waiting outside at the station for the bus. Even we have found a proper solution for communication with the bus conductor and bus driver. So this system proposes a prototype to develop that is capable of monitoring. The project aims to develop a smart bus management system with an LED-based destination signaling system to address challenges in managing bus operations effectively. The system will leverage modern technologies such as IoT and automation to optimize bus operations, improve passenger convenience, and promote sustainable urban mobility. The proposed system has the potential to enhance the efficiency of public transportation, provide a user-friendly experience for passengers, and contribute to a more sustainable and eco-friendly mode of transportation in modern urban living.

KEYWORDS: IoT, LED, Smart Bus, Public transport, urban mobility

I. INTRODUCTION

The current bus management system in many places has been observed to be inadequate and not up to the mark, leading to various issues such as passengers being unaware of bus stops and overcrowding causing communication difficulties between the bus driver and conductor. Despite efforts to improve the system, there is still a need for a more effective solution.

In this project, we aim to address these challenges by developing a bus model that is equipped with 4 LEDs representing 4 bus stops and an LCD screen for the bus driver to send messages during emergency situations. The LED-based destination signaling system will provide clear information to passengers about the bus stops, reducing confusion and delays. The LCD screen will facilitate communication between the bus driver and conductor, ensuring efficient operation of the bus even during congested situations.

By implementing this system, we aim to improve the overall functioning of the bus system, reduce inconvenience for passengers and bus drivers, and enhance the reliability and effectiveness of public transportation. This project represents an attempt to tackle the existing issues and provide a better solution for the bus management system, ultimately improving the overall experience of public transportation for all stakeholders involved.

II. EXISTING SYSTEM

1. Real Time Bus Tracker Application to Reduce Demand Supply of City Buses (2020)

Author: Prof. Mahvash Iram Khan Anjali Thakur, Sneha Ghode, Shalini Chitare, Prachi Shende, Rashmi Gadigone

In paper [1] author proposed a Real Time Bus Tracker Application to Reduce Demand Supply of City Buses. Author developed this system to reduce the supply demand gap for efficient and safe public transport. It is an application in which the user will enter his name, route name, mobile number and time to reach the stop then supply of bus will be

provided. This system also has manager and admin module. Manager will manage and supply of bus, admin will update the system if there any new bus route.

2.Smart Tracking System for School Buses for Ensuring Child Security using IoT Implications and GPS Technology. (2019)

Author: Palvi Shelke, Pravin Dere

In paper [2] author presented the bus tracking system for school bus so parents can ensure the child security. It is based on Biometric technology, it also uses IoT and GPS technology. When a child board the bus the biometric identification is done using fingerprint scanner in bus and system will send the time and location to the parents through server. When child will reach the school again the biometric identification will be done and the details will be send to the parents. This same process will be repeated while coming from school to home.

3.Smart Bus Management and Tracking System (2019)

Author: Priyanka Godge, Kalyani Gore, Apurva Gore, Aishwarya Jadhav, Anuradha Nawathe

In Smart Bus Management and tracking [3] author presents The bus transportation and management system with the integrated system contain the cellular network and GPS which is used in public transportation. This system contains various modules. The bus stop module which contains the RFID tag and also bus module contains RFID reader. This modules have GPS and GSM. It is integrated system which contains the elemental network and Global Positioning System. This is used in public transport. This system is cost effective and works as real time application. The System gives output about bus routes, bus arrival and departure timings, locations.

4.Online Bus Tracking and Ticketing System(2018)

Author: Vinayak Nair, Amit Pawar, D. L. Tidke, Vishakha Pagar and Nikita Wani

In [4] author presented online Bus Tracking and Ticketing System which is useful for the local people as well as Bus Organization. This system helps user to track the bus and save the passenger's time. It is an android application which provides many facilities like bus tracking and cash-less transaction. Passengers who has bus-pass can scan the QR code from conductor mobile app. It also uses cloud technology to store all the data.

5.Smart Bus System (2018)

Author: Sudhir N. Divekar, Sagar R. Patil, Satish A. Shelke

In paper [5]. The author proposed system Smart bus system which is helpful to people who are blind, illiterate and people who are new to cities. Microcontroller check if the bus door is open or not. If the door is open microcontroller will not give the permission to start the bus, this will avoid the accidents due to open door of bus. When bus is ready to departure the next station will get informed about bus will arrive in few time. When bus is near the bus stop bus stand will display and announce the information for passengers.

6.Glimpse: Real Time Transport Tracking System (2018)

Author: Kader Hussain, Irfan Shaikh, Shahidraza Sheikh, Asst. Professor Anand Bali

In [6] author discussed about Glimpse: Real Time Transport Tracking System, this system track the real time location of bus and reduce the waiting time of people. System will get input from conductor and driver of bus number and start the GPS. In every 30 seconds bus location will be stored in database, when user will search for bus number real time bus location will be displayed to user. The primary idea of this system is to provide routes and bus timings to the user in real time.

7.Smart Bus Management System (2018)

Author: Karthikeyan G, Jawahar M L

As mention in [7] this paper proposed a smart bus management system which tracks the bus inside the bus stop. This system helps to avoid the traffic inside the bus stop. The bus has fixed time to be in the particular lane in bus stop. When bus enters the bus stop the timer will be on and if the bus is in the bus stop over the time limit the buzzer will start ringing. Then the higher official will get notified about it through the application installed in their mobile phone.

III. PROPOSED SYSTEM

The bus tracking system developed in this project aims to improve the ease and convenience of bus travel for passengers. The system allows passengers waiting at bus stops to track the arrival time of buses through a web application. It also helps passengers inside the bus to know the next stop by using LED lights. Additionally, the system includes a HotKey System that allows the bus driver and conductor to request help from the admin in case of emergencies. The system provides relevant information about bus details and current location to enhance the overall bus travel experience for passengers.

Block diagram of the System

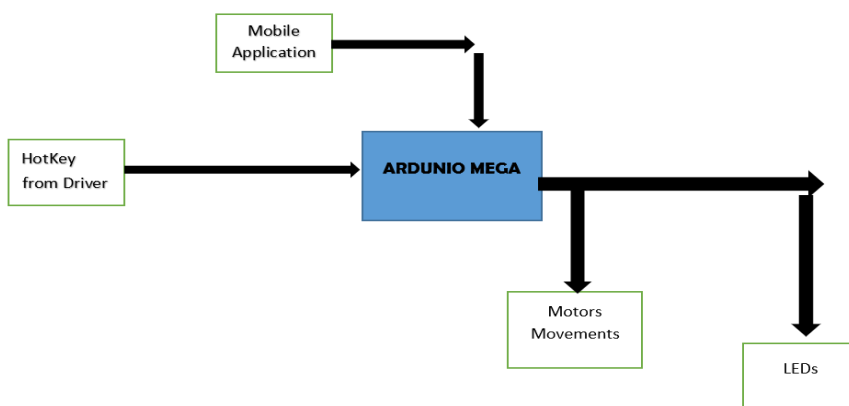


Figure 1: Block Diagram of Proposed System

Components Details

1 Arduino Mega:

The Arduino Mega is a microcontroller board based on the ATmega2560 processor, which offers more I/O pins, memory, and processing power compared to other Arduino boards. It is commonly used in projects that require a large number of inputs and outputs, or complex tasks such as data logging or control systems.



Figure.2: Arduino Mega 2560

2. HC-05 Bluetooth module:

The HC-05 is a Bluetooth module that enables wireless communication between the Arduino board and other devices, such as a mobile phone or tablet. It supports both Bluetooth master and slave modes, allowing for bidirectional communication and control between the Arduino board and other Bluetooth-enabled devices.

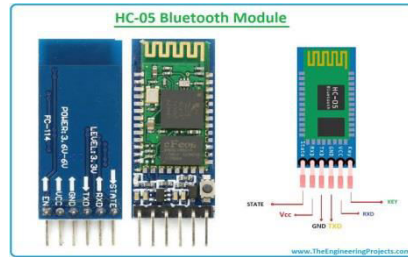


Figure.3: HC-05 Bluetooth Module

3. BO Motor Wheels:

BO motor wheels are commonly used in robotics projects and are typically composed of a motor and a wheel combined as a single unit. They are ideal for driving a vehicle, such as a bus, as they provide rotational motion and can be controlled for speed and direction using the Arduino board and motor drivers.



Figure.4: BO Motor Wheels

4. 18650mAh Battery and Charger:

The 18650mAh battery is a common type of lithium-ion battery that provides a high-capacity power source for portable devices. It can be used to power the Arduino board and other components in the system, allowing for a wireless and portable solution. A charger is required to recharge the battery when it is drained, ensuring continuous operation of the system.

IV.METHODOLOGY

Flow chart:

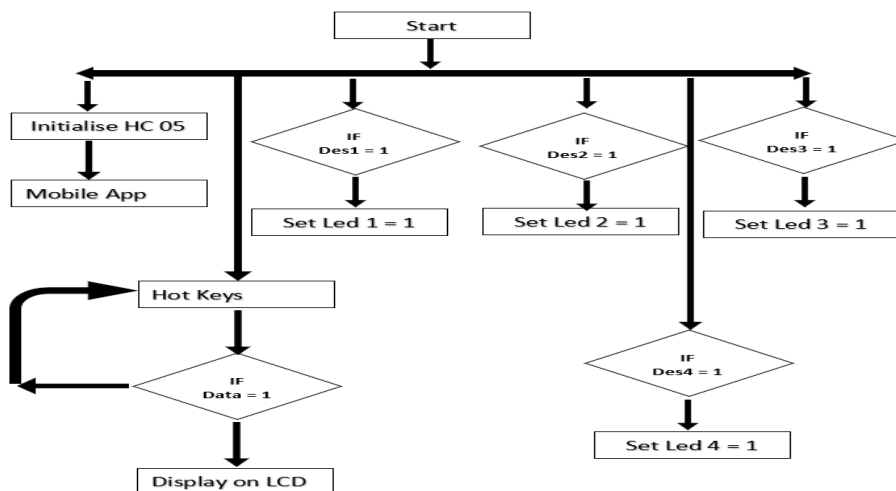


Figure.1: Flow Chart for Smart Bus Management System

Working:

The system gives output through LED lights installed in the bus. This system gives the information about next stop for the passenger inside the bus by glowing the LED. When the next comes near the LED light will glow for the next stop. This system help people that are new to the city to travel from bus easily. In cases like if bus fail to complete its journey due to certain circumstances like failure in the mechanism or like accidents, bus driver or conductor will inform admin and ask for help.

V.EXPERIMENTAL RESULTS

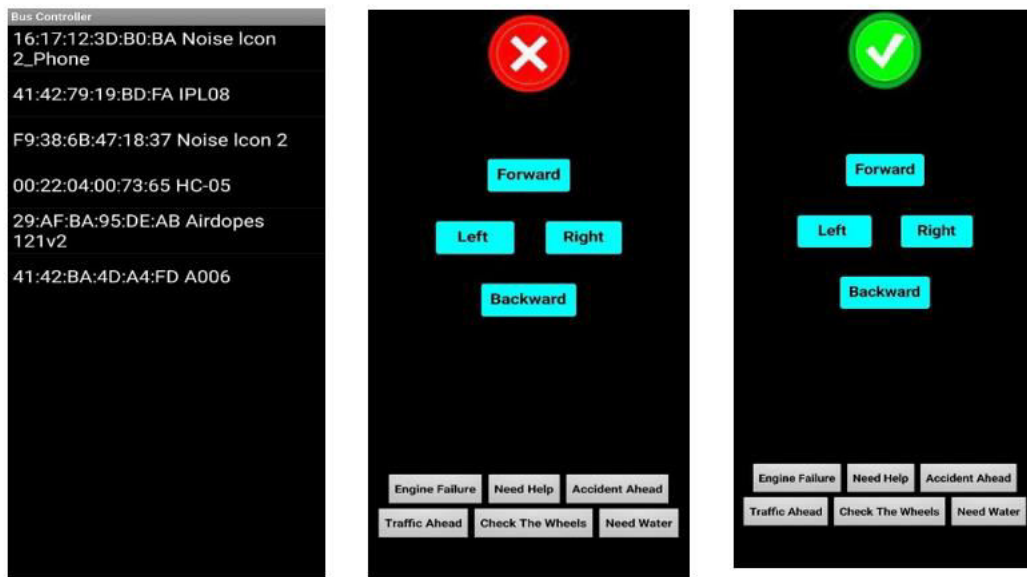


Figure.1: Configuring Model to Bluetooth

Model:



Figure2. Model Snapshot

VI. FUTURE SCOPE

The future scope of the smart bus management system includes enhanced safety features, predictive maintenance, integration with fare payment systems, and data analytics and reporting capabilities. Enhanced safety features could include GPS-based tracking for real-time location updates, panic buttons for passengers and drivers, automated alerts for unsafe driving behavior, and remote monitoring of bus operations for safety compliance. Predictive maintenance capabilities could use data from sensors to monitor bus components and predict maintenance needs, reducing unexpected breakdowns and minimizing maintenance costs.

Integration with fare payment systems could streamline fare collection processes, including automatic fare deduction and real-time validation, improving efficiency and reducing revenue losses. Data analytics and reporting could collect and analyze data for optimizing bus routes, improving operational efficiency, evaluating system effectiveness, and making data-driven decisions for system enhancements. We can add camera and voice system for direct communication between bus driver and bus conductor. We can use pic microcontroller to reduce the cost.

VII. CONCLUSION

The smart bus management system has the potential to provide effective control over the movement of a bus and track distance traveled. The system utilizes commands sent from a mobile application to an Arduino board with HC 05 module for controlling the bus motors, and incorporates a counter for tracking distance. When a destination is reached, the system provides alerts through an LCD screen, buzzer, and LED indicators.

However, the conclusion on the effectiveness and reliability of the system would depend on several factors, including the accuracy and reliability of the command transmission from the mobile application to the Arduino board, the accuracy and precision of the distance tracking using the counter, the functionality and visibility of the LCD screen, buzzer, and LED indicators, as well as the safety measures in place to ensure passenger safety.

It would be important to thoroughly test and validate the system in real-world scenarios to ensure its reliability, accuracy, and safety. Additionally, regular maintenance and updates may be required to ensure the continued functionality and effectiveness of the system.

Overall, with proper implementation and testing, a smart bus management system has the potential to improve the control and alerting capabilities of a bus, providing enhanced efficiency and convenience for both passengers and operators.

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