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An Efficient Method for Bus Status and Fare Collection

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***Abstract* – The rapid growth in the population in India causes more crowding at bus stops. This is due to the long wait for arriving on buses and suddenly gather near the bus when it arrives and travel in overcrowded buses on footboards which leads to accidents. Nowadays lots of passengers are also struggling to find the correct bus which they supposed to travel to. All this happens due to a lack of information about arriving on buses at many of the bus stops. The fare collection system currently in bus transportation is not efficient and corrupted. The conductors collect different amounts of money from different persons also they will not give balance. The objective of this paper is the design of a tracking and management system for a public transportation system using Radio Frequency Identification(RFID). In this work, each bus stop is tagged with a unique RFID card which gets detected by the RFID receivers at bus. The RFID receivers are attached to a NodeMCU module which immediately sends its status to the cloud server. Data from the cloud server is made available to the end-user as a simple user interface in the form of an application. All these technologies will helps the passengers to locate the nearest approaching buses. Also In this paper, we are mainly focusing on different technologies that are available for smart use of bus transportation. Now all around the globe, there are many new technologies that make bus transportation smart. The main technologies like BRTS, Rav Kav card, etc. The system will help passengers to track each bus.that is the main advantage of our system. Also, it helps to anti-corruption and efficient use of the bus transportation system.**

Keywords– Vehicle tracking; RFID; NodeMCU; Cloud computing; React native; Blockchain.

I. INTRODUCTION

In India most of the people uses public buses as there primary mode for journeys. With a population of 1.3 billion in India , there are currently 1.9 million buses are operation in different states. Within that count only 2.8 lakhs of them runs under state transport. Some central Govt. reports shows that India has only 14 buses for 10000 people. Within this scenario we can saw the number of buses currently operating are going down due to various reasons. Many times, most of the travellers find themselves late to work or missing important occasions due to unavailability, miscalculation of bus timings.

There might have been many buses that pass through the bus stops in nearby areas around the same time and those buses might even have run close to empty. But unaware of this information about the timings of buses, they are forced to alternatives such as taxis and auto-rickshaws.

Technology can provide a comprehensive solution to this problem. Public buses with vehicle tracking systems play a major role in the developed system. For tracking a bus we use an IoT-based bus monitoring system.

IoT is defined as the inter-communication of "connected devices" and "smart devices", and other items embedded with electronics, software, sensors, actuators, and network connectivity, which enable these objects to collect and exchange data. Each buses will be occupied with RFID readers identifies the tag placed bus stops and send the data to the cloud via NodeMCU . A build-in application is used by travellers to know the running status of the bus, appended with location and expected time of arrivals.

Sss

II. PROBLEM STATEMENT

Due to ever-increasing population, even though the number of people travelling by bus is increasing, the number of people opting for their own vehicle are also rapidly increasing. Because of many times, they find themselves late to work or missing important occasions due to unavailability, miscalculation or mix up in bus timings. There might have been many buses that pass the stops in their area around this time and those buses might even have run close to empty. But unaware of this, they are forced to miss this economical means of public transport and look for other, more expensive alternatives such as cabs and auto-rickshaws. This has also resulted in heavy loss to the government that fund the transportation industry.

III. RELATED WORKS

In Ahmadabad, BRTS technique is carried out for bus transportation. The traffic block in Ahmadabad may be very bad. The humans lost plenty of there time by waiting inside the block. So the authorities of India got here up with a brand new smart technique referred to as BRTS(Bus Rapid Transit System) which help human

beings to attain destination quicker with out waiting in the visitors block. The device was a success in India. The device will only help to keep away from visitors blocks it will not give modern-day repute of bus.

The rav-kav card in Israel is an clever card used to make electronic bills and additionally a fare collection system. The smart card used in smart railways in addition to bus companies. The users can capable of placed money inside the rav-kav card the use of debit card or credit card. This technique help to provide a smart environment in bus transportation.

The paper by Vipul Pandey proposes implementation of a Real Time bus Tracking (RTBT) system, by installing GPS devices on city buses which is able to transmit the present location through a GPS Receiver. The GPS Receiver will interfaced with computer and it'll auto save data. The application will collect the data and store it in server. This data is employed for the display of real time information of bus. The uncertainty in the arrival of bus is the main problems of public installation. When the info that's collected is given to traveler as per their requirement through internet, they will use their time with efficiently.
In India there exist an mobile/web application called redbus which assist to provide green bus price tag booking system. It join bus visitors with loads of buses. The redbus was based in 2006 to offer green way of bus ticket reserving.

IV. SYSTEM ARCHITECTURE

The proposed system will provide live location tracking of each bus. So the user can avoid waiting time. Also the disadvantages of the current system is also overcome by the proposed system.

1. Bus Module
Consists of RFID reader and NodeMCU. Reader consist of a RF module, control unit and an antenna coil. Antenna is used to generates high frequency electromagnetic field. When the tag gets power due to the presence of nearby reader, it can extract the transmitted message from the reader. For sending the message back to the reader, it uses a technique called load manipulation. Switching on and off a load at the antenna of the tag will affect the power consumption of the reader's antenna which can be measured as voltage drop. The RFID works in the frequency range of 865 MHz to 928 MHz to provide a longer range up to 10 meters. The bus module consists of an RFID reader connected to the NodeMCU. Here the reader collects the unique ID of tag and sends to the cloud via NodeMCU.

2. Bus Terminal Module
Each bus stop consists of unique RFID tag. Tag is a passive component consists of antenna and microchip. When a passive RFID tag is scanned by a reader, the reader transmits electromagnetic energy to the tag which powers it enough for the chip and antenna to relay information back to the reader. When the RFID reader placed in the bus gets near the electromagnetic field of the reader, a voltage is generated due to induction in its antenna coil. This voltage serves as power for the microchip in the RFID tag.

3. Data Processing Module
This module is the heart of the system. In this section all computation taking place. The module responsible for ticket booking, Bus status tracking etc. This module also contain database for storing user data as well as bus status. We implemented cloud computing functionality to our system. By implementing this feature we can able scale our resources. Also we are implementing blockchain for payment.

This helped our system to make more efficient cash transactions. We are using nodejs server handing routes from user interface(ClickBus app).

- **Algorithm**

Step 1: Expected time of arrival for each bus stop in the status log is initialized with a predetermined value.
Step 2: Database will update the actual arrival field based on the indication from the bus module when the bus reaches each bus stop.
Step 3: If any updation occurs, program will compare the expected time and the actual time. If both are equals jumps to step 6.
Step 4: If both are unequal update the expected time for all upcoming stops.
Step 5: New expected time= Actual time + (Actual time – Predetermined actual time)
Step 6: Check whether the bus reached the destination. If destination has not been reached, loop back to step 2.

4. Payment Module
Unlike other payment systems we are implementing blockchain in our payment system. This will help our applications to work without any treats. We are using truffle suit for developing blockchain API for our system. This module take three inputs (UID, cost, Balance). Based on the cost each user will deducted from his/her balance

5. User Module
This module is responsible for interacting with users. We are using react native framework for creating native apps. By using this we can able to reduce our system requirements. React Native is an open-source mobile application framework created by Facebook.

It is used to develop applications for Android, iOS and Web by enabling developers to use React along with native platform capabilities.

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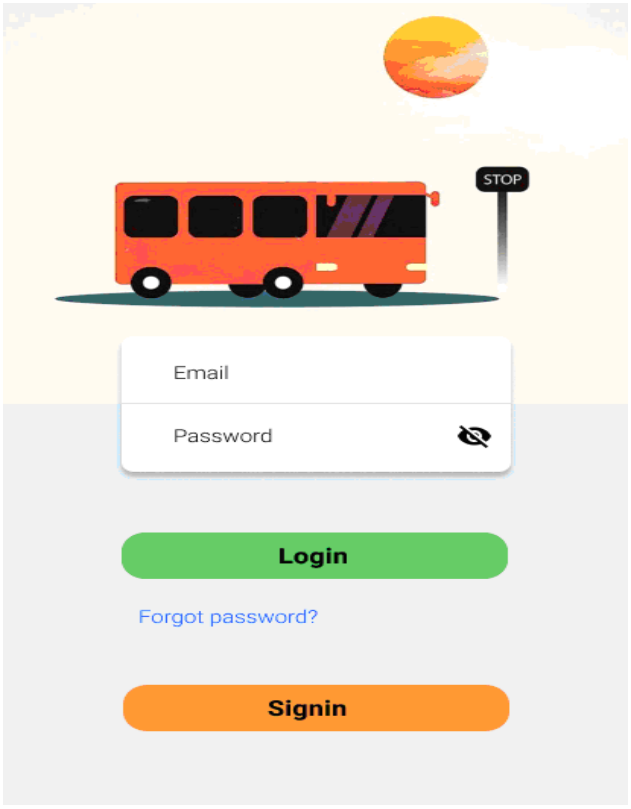

Fig 1. Login page of developed application.

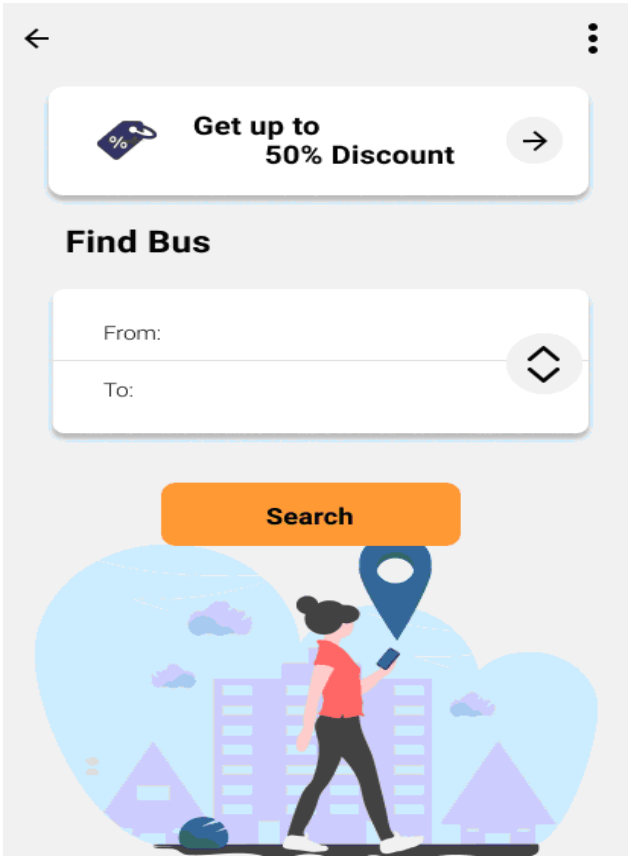

Fig 2. Search by route.

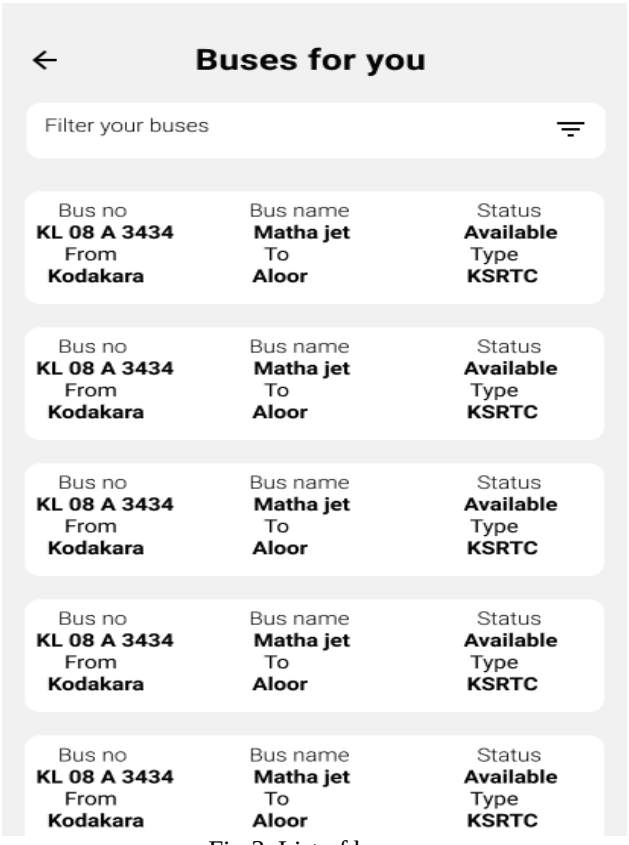

Fig 3. List of buses.

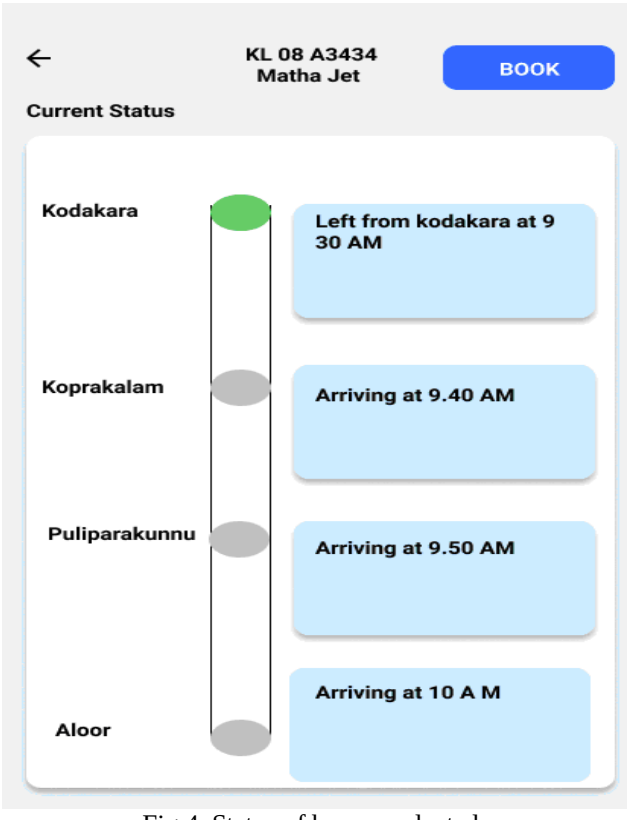

Fig 4. Status of bus we selected.

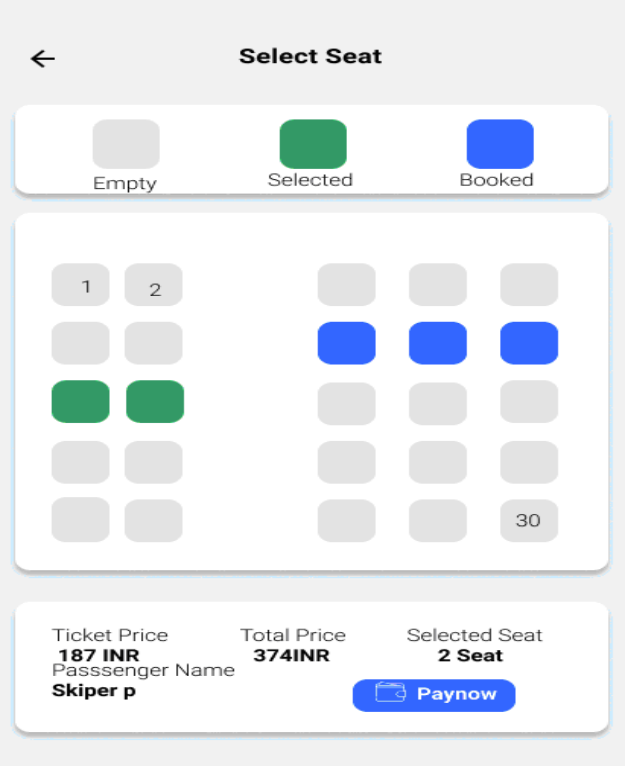

Fig 5. Select the seat for booking.

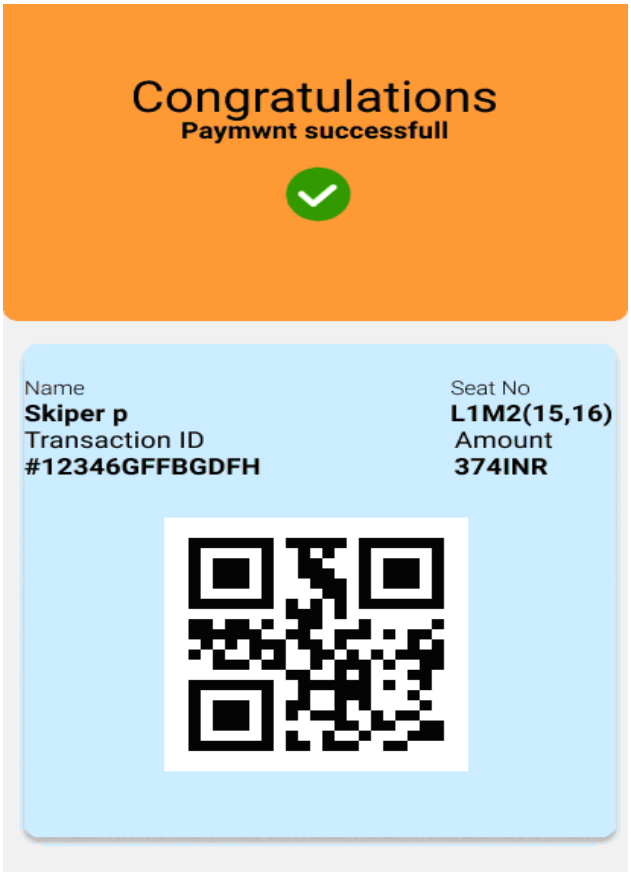

Fig 6. QR Code of Bus ticket.

The application consists of a login page, homepage, bus list, seat booking , payment pages. When the passenger enters his departure point and required destination (Fig. 2) in the find bus option he is taken to a page displaying a list of all buses(Fig 3) along with their registration numbers replying through the given points arranged in descending order of expected arrival time. On selecting a particular bus from the list, the user is directed to another page showing details of the intended bus such as its route, current location and expected arrival time at the required destination. User can then select the required seats and complete the payment transaction through online. After completing the payment transaction passenger will a digital ticket (Fig 6)with QR code which can be used for the travel purpose. QR code will get cross checked by the bus conductor and verify while traveling.

V. IMPLEMENTATION

An attempt was made to implement the bus management and tracking system discussed in this paper using simple short range tracking devices which are easily available in electronic markets.. An RFID tag of 13.56 MHz was used in place of the Bus Terminal module and an MFRC522 RFID reader interfaced with a NodeMCU working on ESP8266 was used in the Bus module. The 5 V supply to power up the nodeMCU was provided via USB from a Laptop. The RFID reader required a modest 3.3V supply derived from the NodeMCU itself. NodeMCU was coded using Arduino IDE software open source platform Using the realized system, signaling of presence of an RFID tag by the reader was observed. This was done by displaying the Unique Identification code (UID) of the particular RFID tag in the serial monitor provided by the Arduino platform. Presence of multiple tags resulted in queuing of the UIDs and corresponding serial display in order of decreasing closeness. Data processing was done in the micro controller unit of NodeMCU. This implemented circuit is given in Fig. 7. The digital ticket that we booked through online is given in Fig 6

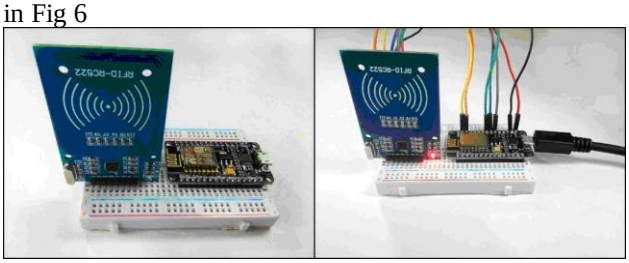

Fig 7. Photograph of developed system.

VI. CONCLUSION

In this work, issues arising from lack of proper resources to manage and track public buses along their routes by the public was discussed and an efficient solution was proposed in the form of a bus tracking and online ticket booking system. The system will serve the purpose of bus

tracking, sending this information to the cloud storage, processing the received data in the cloud and finally providing the end users(passengers) with a user-friendly means of locating buses along their desired route with the help of a smart application thereby minimizing congestion during rush hours and cutting back on waiting time of passengers at bus stops. This system can be realized with limited expenditure on the part of the transport system and trivial cost on the passenger side.

VI. ACKNOWLEDGMEN

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