International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 04 | Apr 2022 www.irjet.net p-ISSN: 2395-0072

Smart Ticketing System for Public Transport

Tushar Suvarna[1], Aditya Mali[2], Purushotham Panasa[3], Sanmitra Kamble[4], Mahalaxmi Palinje[5]

[1,2,3,4]B.E. Student, Dept. of Electronics and Telecommunication, Atharva College of Engineering, Mumbai, India
[5]Professor, Dept. of Electronics and Telecommunication, Atharva College of Engineering, Mumbai, India

---

Abstract - *Modern cities of today have developed multiple means of transportation including buses, trains, metros, etc. Now each public transport system has their own ticketing system and it becomes a hectic process for commuters to manage separate smart cards or apps for every transport medium. A smart approach is needed that integrates all these systems together and allows for a centralized system for all transportation mediums. Furthermore, in developing and under developed countries in any public transportation printed tickets are still in use, once the commuter reaches his/her destination, the ticket is of no use and is eventually thrown away leading to huge paper wastage which eventually leads to deforestation.*

Key Words: RFID, public transport, commuter, bus, ESP 32, Node.js, MongoDB, IoT.

1. INTRODUCTION

The following project is an upgrade for our public transport. Smart ticketing system for public transport is a project to bring all the ticketing methods to one single platform or one single card. A single card can be tapped at the RFID machine and one needs to enter the travel details via the keypad provided after which the ticket will be sent on your smartphone via SMS. A particular app is developed for that has a guardian or parental control which can give you the location of the card holder, a safety feature for the users. As all the ticketing method are united in to one single form the queue lines will also have detracted time for tickets. As the tickets are e-generated the paper usage will also take a big toll off you can never lose a ticket and you will always have a record of where have you been.

2. LITERATURE REVIEW

Our current ticketing system for public transport still uses paper tickets except for metro. Recently, BEST started a card system for monthly, quarterly, and yearly passes. But as per BEST administrative sources this system has been conceding loss since the past few years especially from the start of COVID-19 pandemic. Reason behind the failure is that commuters have to go to the specific bus depots to recharge the card. At the end of every month there is a long queue outside bus depots to refill the pass. As COVID-19 situation started in our country every public transport has conceded economic loss. BEST has conceded more losses in this time compared to the last 5 years and therefore most of BEST depots have shut the pass system.

In [1], Meet et. al. proposed a ticketing system for bus transport that provided passengers with a real-time location of the bus to save their time which would otherwise be wasted while waiting for the bus. Also, the huge amount of paper waste generated by printed tickets can be avoided as their system provides tickets to passengers digitally. The analysis created based on a simulation of their system can help the bus management with proper planning of the bus schedule. Bus management can use this analysis to generate relevant data such as the frequency of passengers on each day, peak times and the most used route which will help them in planning the bus schedule to fulfil passenger's demand as well as in generating revenue.

In [2], Shreya et al. proposed a Smart ticketing system using RFID to make bus journeys paperless. In the paper, they mention that after passengers reach their destination they throw the ticket, as it is of no use. To overcome this issue the authors proposed a system in which they used RFID microcontrollers - Arduino uno and Raspberry Pi. The reader system along with the GPS module is attached at the entry and exit. When the passenger enters, he has to tap the card at the reader, the RFID reader reads the card and the GPS module records the exact coordinates where the passenger boarded the bus. At the destination the passenger has to tap again, then on the basis of the distance travelled the fare is calculated and the fare will be deducted from the RFID card.

In [3], Telugu et. al. proposed a ticketing system using microcontroller and IoT, demonstrated with a laboratory prototype. This system can be used to travel in any mode of transportation like Bus, Trains, and Metros using only one smart card. The system is tested for functions like detecting and authenticating the smart card and for ticket purchasing. Also, it reduces the major source of financial loss due to printing of tickets on paper. The author also aimed to fabricate the system as an industry model and planned to extend its application to any authenticated transport billing system.

In [4], Pavan et al. proposed a bus ticketing system using RFID to digitalize the ticketing system which will be comfortable for passengers as well as workers and to overcome challenges such as security, unreliability and malfunctioning issues. The automated ticketing system will be kept inside the bus. After tapping, the reader scans the card and displays the name and the boarding location which will be stored in the database. Then a 4-digit pin will be

asked. If the pin entered matches, then only the user is allowed to access the card. After the pin verification, the user has to enter boarding and destination points and the number of persons. After getting off at the destination the selected point will be checked. After checking boarding and selected destination coordinates, the fare will be calculated and deducted from the card balance.

In [5], Aman et al. proposed a Bus Ticket Generation System which is based on RFID and IoT. Their main goal is to reduce the confusion about fares and pay the correct amount. The project is implemented using an RFID card, Arduino and servo motor. The authors explain that the ticket generation will be kept at the entrance of the bus. The passenger has to tap the card on the reader and select the destination. The amount will be calculated and will be deducted from the balance. After deduction, the bus doors will be opened for 30 seconds. Using the servo motor the doors will open and close. The Wi-fi module is used for wireless transactions of data between the system and the database.

In [6], Bhumik et al. made a bus ticketing system using RFID to avoid paper pollution and the money change causes quarrels among passengers and conductors. In addition to this, as the crowd keeps on increasing, the conductor is not able to move throughout the bus 7-10 times. So, the authors placed the RFID readers at the entrance and exit of the bus. The user has to place his RFID card on the reader and select the source and destination; the amount will be deducted and the available balance will be shown on the display.

In [7], Prafulla et. al. presented a fully automated, reliable, transparent and convenient system for ticketing where GPS was used for the distance measurement and fare calculation. They proposed a universal travel pass card that allows transportation on any route. Since fare calculation is done through proper distance measurement using GPS, fare is crystal clear and provides no room for confusion. They also created a database for travelers which could be accessed via the internet using a USB modem.

3. BLOCK DIAGRAM

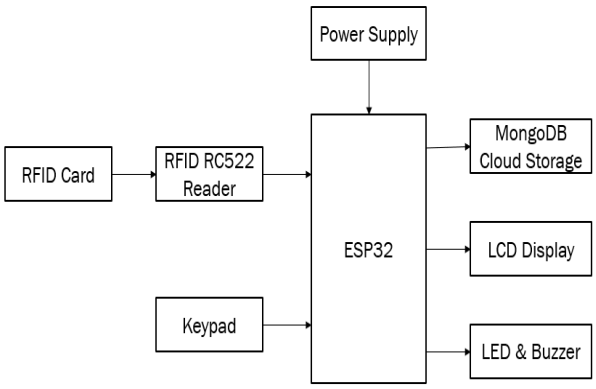

Fig -1: Block Diagram

Components Used

NodeMCU ESP32

NodeMCU ESP32 consumes less power and it is less expensive than other microcontrollers. It comes with an inbuilt Wi-Fi module and has a dual-mode Bluetooth. It has integrated antenna switches, filters, power-management modules, low-noise receive amplifier and a RF balun. Expressif Systems is the company that developed the ESP32 and TSMC is the company that manufactures ESP32. With high-speed caches, the SRAM and the external QSPI flash is accessed. In the CPU code space, a 16 MB of external flash are memory mapped and an 8-bit, 16-bit and 32-bit access is supported. In the CPU data space, an 8 MB of external SRAM are memory mapped and an 8-bit, 16-bit and 32-bit access is supported.

RFID RC522 Reader

RFID Reader is nothing but a Radio Frequency receiver and transmitter which read and write information on to a RFID tag. RRC522 is a 13.56 MHz RFID card Reader module. It is a very low-cost reader and it is based on MFRC522 which is very easy to use on large variety of applications. This compact size read and write chip is designed by NXP.

20x4 LCD Display

A 20x4 LCD means it can display 20 characters per line and there are 4 such lines and each of the characters are displayed in a 5x7 pixel matrix. It has two registers, namely, data and command.

I2C Module

I2C module consists of an integrated PCF8574 chip which converts I2C serial data to aligned data for the LCD display. Contrast on the LCD display can also be adjusted using this module.

4x4 Matrix Keypad

If we link 16 buttons to the microcontroller, then each button takes 1 GPIO pin. But with matrix keypad, we only need 8 pins. The keys at each of the rows are connected to a pin called ROW pin, namely, R1, R2, R3, and R4.

Software Specifications

A. Stack used in Backend

Node.js

Node.js is a backend JavaScript runtime environment which runs on the V8 engine. It is an open source; cross platform JavaScript runtime environment that executes JavaScript code outside a web browser. Node.js represents a "JavaScript everywhere" paradigm and a development around a single programming language, rather than different languages for server side and client-side scripts.

Express.js

Express.js, a backend web application framework for Node.js is used for creating servers. It is an open-source software under the MIT license, programmed for creating web applications and APIs.

MongoDB

MongoDB is used for creating and managing the database. It is a source available semi structured database program. It is developed by MongoDB Inc. and it is authorised under Server-Side Public License.

B. Frontend

React Native

React Native is used for creating Apps. It is an open source and user interface software framework. It developed by the Facebook Inc. We can develop Apps for iOS, MacOS, Android, Android TV, Windows and UWP by using the React Framework along with the native platform capabilities.

4. CIRCUIT DIAGRAM

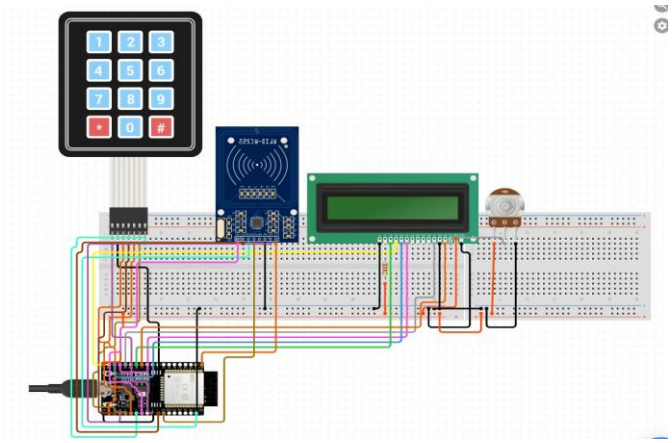

Fig -2: Circuit Diagram

Right side pins are of NodeMCU and the left ones are pins of the particular component.

RFID scanner connection: Reset/RST-D0, SDA-D5, MOSI-D23, MISO-D19, SCK-D18, 3.3V-3.3V, GND-GND

Keypad connection: D1, D2, D3, D4, D6, D7, D8

LCD connection: I2C, SCL–D22, SDA-D21, VCC – 5V, GND-GND

5. 3D PRINTING TECHNOLOGY

In the next 10 years, 3D printing technology will revolutionize manufacturing processes worldwide. This technology helps in making the devices light weight and easy to handle. Our whole ticketing system is fixed in 3D printed enclosure made of PLA (Polylactic acid) filament. PLA is often compared with ABS plastic but the later one has an upper hand in preference. PLA plastic is eco-friendly and requires less energy to process and makes it better to utilize.

6. RESULT

The proposed system with tickets being e-generated and sent to passenger via SMS eludes the daily problems of printed tickets being of no use once the passenger reaches the destination, and it being eventually thrown away leading to pollution. Also, an added feature of the proposed system is an app with a parental-guardian approach using which the commuter's guardian can be alerted about his/her whereabouts using GPS tracking.

Fig -3: Successfully purchased ticket using our system

Fig -4: Hardware system enclosed in a 3D printed enclosure

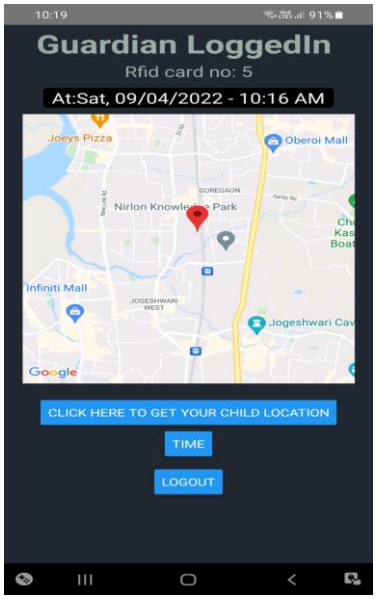

Fig -5: Commuter's location accessed by guardian

Thus, we were able to design and implement a smart ticketing system that integrates all public transport systems together and allows for a single master card and a centralized system for all transportation mediums, ensuring a seamless ticketing experience for commuters and also ensuring the safety and security of commuters.

7. CONCLUSION

This paper provides solution for passengers as well as the transport system by making the ticketing system smart, ensuring a seamless ticketing experience. This system works on NodeMCU ESP32 that comes with an integrated Wi-Fi module that costs less compared to other microcontrollers thus reducing the overall cost of the entire system. The aim of this paper was to give a brief information about paperless ticketing system for public transport that integrates all the three major modes of transports.

REFERENCES

[1] Meet J Shah Dept. of information Technology St. Francis Institute of Technology Mumbai, India meetshah133@gmail.com, Rajesh P Prasad Dept. of Information Technology St. Francis Institute of Technology Mumbai, India, Aashutosh S Singh Dept. of Information Technology St. Francis Institute of Technology Mumbai, India.

[2] Shreya Andhale, Nirmayee Dighe, Akanksha Kore,Darshana Gaikwad,Jayasudha Koti Dept. Electronics and Telecommunication Engg. St. Francis Institute of Technology, University of Mumbai Mumbai, India.

[3] Telugu Maddileti, Department of ECM, SNIST, Telangana, India. R.K. Pongiannan, Dept. of EEE, SRMIST, Kancheepuram, Tamilnadu, India. V. Kranthi Sai Reddy, Department of ECM, SNIST, Telangana, India. V. Sai Jahnavi, Department of ECM, SNIST, Telangana, India. S. Prathima, Department of ECM, SNIST, Telangana, India.

[4] Pavan Telluri, Sara deep Manam, Jayashree M Oli Department of Electronics and Communication Engineering, Amrita School of Engineering, Bengaluru, Amrita Vishwa Vidyapeetham, India.

[5] Aman Kaushik1, Kumar Sanu2, Kajol Singh3, Aayush Raj4, Sumitra Kumari5 1Assistant Professor, AIT-CSE, Chandigarh University, Mohali, Punjab, India 2,3,4,5Student, AIT-CSE, Chandigarh University, Mohali, Punjab, India

[6] Bhumik Patel Department of Computer Engineering, University, Mumbai, Palghar, India., Parthvi Pandey Department of Computer Engineering, University, Mumbai, Palghar, India, Durvesh V. Sonar Department of Computer Engineering, University, Mumbai, Palghar, India, Tina D'abreo, Department of Computer Engineering, University, Mumbai.

[7] Prafulla P S Dept. ECE BGSIT, Nagpur, Kalavathin S N Dept. ECE BGSIT, Nagpur, Hema K J, UG student Dept. ECE BGSIT, Nagpur.

[8] Sunitha Nandhini.A 1, Sangeetha.G 2, VidhyaJanani .J 3 Assistant Professor, Department of Computer Science and Engineering, Sri Krishna College of Technology, Coimbatore.

[9] Karthika J, Varshanapriyaa S, Sai Haran S, SuriyaPrakash C Assistant Professor, Department of EEE, Sri Krishna College of Engineering & Technology, Coimbatore, Tamil Nadu UG Student, Department of EEE, Sri Krishna College of Engineering & Technology, Coimbatore, Tamil Nadu.

[10] A Dr. V.Geetha, Assistant Professor in CSE Department, SCSVMV Deemed to be University. Dr. C.K.Gomathy, Assistant Professor in CSE Department, SCSVMV Deemed to be University Nirnipreetham, UG Scholar CSE Department, SCSVMV Deemed to be University Ponugotipavan kumar, UG Scholar CSE Department, SCSVMV Deemed to be University.

[11] Varun Kaushik 7th semester, Electronics & Communication R.V College of Engineering Bengaluru, India, Suhas P 7th semester, Electronics & Communication R.V College of Engineering Bengaluru, India.

[12] Dr. Vinit Kotak, "RFID-based bus ticketing system using android and GTFS", International Journal of Advanced

Research in Computer and Communication Engineering (IJARCCE) Vol. 5, Issue 3, March 2016.

[13] V. Apsara, "RFID based bus ticketing system for Public Transport System (PTS)", International Journal of Industrial Electronics and Electrical Engineering (IJIEEE) Vol. 4, Issue 5, May 2016.

[14] Mr. Mohammad Osman, "Enhancement of Public Transportation services using wireless technologies like Zigbee, RFID, GSM and GPS", International Journal of Engineering Trends and Technology (IJETT) Vol. 6, No. 7, December 2013.