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Smart Ticketing RFID System

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Abstract: *This project presents an intelligent, automated ticketing system designed for college bus transportation using Radio Frequency Identification (RFID). The system replaces traditional manual ticketing and physical attendance logs with a secure, prepaid RFID smart card system. Each student is issued a unique RFID tag, which they swipe when boarding (Touch On) and alighting (Touch Off) the bus. An onboard RFID reader, connected to a microcontroller (e.g., Arduino/Raspberry Pi), validates the card, calculates the fare based on distance (or boarding status), and deducts the fare automatically from the student's pre-loaded e-wallet.*

In the digital era, public transportation systems are evolving to embrace technological advancements to enhance efficiency and passenger convenience. The Eco-Pass project aims to implement an RFID-based smart ticketing system for public buses, replacing traditional paper tickets with a more streamlined and user-friendly approach. This system utilizes RFID technology to automate fare collection, reduce boarding times, and provide real-time data analytics for transit operators. By integrating a mobile application and a robust backend system, Eco-Pass ensures seamless user interaction, easy account management, and secure transactions. The project focuses on creating a scalable, efficient, and secure ticketing solution that can significantly improve the overall passenger experience and operational efficiency of public transportation systems. Through this innovative approach, Eco-Pass addresses common issues such as ticket fraud, manual fare collection errors, and passenger inconvenience, paving the way for a smarter, more connected urban transit infrastructure. This report outlines the system design, implementation plan, and expected outcomes of the Eco-Pass project.

A smart bus ticketing system is a new technology for bus transportation. As technology is improving smart bus ticketing is an innovation in transportation. Every passenger needs good transportation to reach their destination. The smart bus ticketing system is developed using RFID technologies. RFID technology is used for scanning RFID cards. Passengers should carry the RFID card to travel by bus. GPS is used for tracking the location. Based on the destination the amount is fixed for tickets.

Keywords: *smart bus ticketing system*

I. INTRODUCTION

The introduction of a smart bus ticketing system is designed using the RFID module. Every passenger must have an RFID card with them. RFID card should have access if the passenger has access then it will show the passenger details like user name. If the passenger does not have access to the card it will show a message as access dined. Then he/she should get the access to scan card. As much as technology grows the automatic bus ticketing will be a new start in bus transportation. An E-ticketing system is introduced it is a waste of time at ticket counters to reduce this problem smart bus ticketing system is introduced. The paper-based ticket is a waste of paper it is time and more consuming process. If hard copied tickets lost in the middle of traveling it will be a problem to passenger and conductor he cannot give a new ticket again. So this is the most identified problem to reduce this new technology that has been developed.

The introduction of a Smart Ticketing RFID System for a college bus project focuses on replacing traditional paper-based ticketing with an automated, electronic, and contactless method to improve efficiency, security, and passenger

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experience. This system uses RFID cards as digital tickets, allowing students to scan their ID when entering the bus for immediate identification, authentication, and, if required, automatic fare deduction from a digital wallet.

Background:

Public and private transportation systems, including those run by colleges and universities, are increasingly adopting technological advancements to enhance efficiency. In traditional systems, conductors manually issue tickets, check IDs, or manage cash, which is time-consuming, prone to errors, and insecure. With the growing student population and the need for stricter security on campus transport, an automated approach is necessary.

The Proposed System:

This project proposes an intelligent, user-friendly Smart Ticketing System using RFID (Radio Frequency Identification) technology. Each student/passenger is issued a unique RFID-tagged card. When a student boards the bus, they scan this card against an RFID reader installed at the entry. The system automatically verifies the passenger's identity and, depending on the implementation, can:

- Record attendance and boarding time.
- Deduct fares automatically based on distance.
- Allow entry only if the card is valid.

Problem Statement:

The current manual ticketing and passenger tracking system face several issues:
Wastage of Time: Manual ticketing causes delays during boarding, creating rushes.
Security Risks: Difficult to identify authorized passengers boarding the bus.
Paper Wastage: Conventional paper tickets are not eco-friendly and cause litter.
Cash Issues: Problems with exact change or mismanagement of funds by unauthorized persons.

II. LITERATURE SURVEY

[1] In this paper, the authors designed a smart card for the passengers to collect money form their E-wallets. When passengers enter the bus the conductor will scan the card to generate a ticket.

[2] A key challenge addressed in the literature is the inefficiency and inconvenience of traditional bus ticketing systems. A study by Venkata Subba Reddy Bakka and Sai Sri Nidhin Tankala highlights the potential of RFID technology to enhance the passenger experience in public transit systems. Their research underscores the importance of creating a seamless, paperless environment which not only speeds up the boarding process but also reduces the operational costs and fraud associated with traditional ticketing methods.

[3] Another significant issue is the sensitivity and reliability of RFID systems in various environments. Rahma Zayoud and Habib Hamam explore the enhancement of passive UHF RFID technology to improve its application in challenging settings. Their work focuses on increasing the range and accuracy of RFID systems, which is crucial for effective implementation in public transit, where varying conditions and dense usage are common.

[4] Real-time data integration is essential for optimizing public transportation systems. Josef Hoppe and Felix Schwinger discuss the benefits of combining short-term forecasts with real-time occupancy data. This approach allows for more accurate predictions of passenger numbers, enabling better resource allocation and improving overall service efficiency. Their findings are particularly relevant for the EcoPass project, which aims to use real-time data to enhance operational decision-making.

[5] The need for modularity in web application programming interfaces (APIs) for e-commerce systems is emphasized by Alistair Barros, Chun Ouyang, and Fuguo Wei. Their study resonates with the limitations of traditional platforms, where functionalities like search and product details might be tightly coupled. For the EcoPass system, a modular API

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can provide the flexibility and scalability needed to adapt to varying user needs and integrate seamlessly with other services.

III. HARDWARE OVERVIEW

HARDWARE OVERVIEW

3.1 SYSTEM BLOCK DIAGRAM

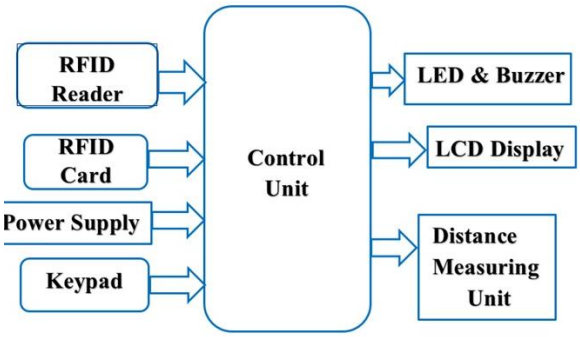

Fig. 3.1: Block diagram of system

3.2 BLOCK DIAGRAM DESCRIPTION

The block diagram above represents the architecture of the proposed project "Smart Ticketing RFID System". The system consists of a microcontroller. This controller is Arduino Uno microcontroller, programmed to control and perform the desired operation of the designed system. This microcontroller is the brain of the complete system.

The circuit requires a regulated power supply for the complete action of each component in the circuit. This requirement of power is fulfilled by the power supply unit in the system.

Problem Definition:

The traditional public transport ticketing system is inefficient, time-consuming, and prone to revenue leakage. Conductor-driven manual ticketing, paper ticket issuance, and manual fare calculation result in long queues during peak hours, environmental waste, and frequent arguments over exact change. Furthermore, the lack of real-time passenger data prevents effective transportation planning and management.

Key Problems in Existing Systems-

Time-Consuming Process: Manual ticket issuance by conductors is slow, leading to long boarding times and delays.

Revenue Leakage and Fraud: High probability of ticket fraud, such as passengers travelling without tickets or conductors misreporting ticket sales.

Environmental & Financial Cost: Massive reliance on paper tickets creates environmental waste and high costs for printing, storage, and disposal.

Cash Handling Issues: Lack of exact change causes disputes between passengers and staff.

Lack of Real-time Tracking: No automated way to track passenger demand, peak hours, or the exact location of passengers and buses.

Lost Ticket Risks: Passengers must protect physical paper tickets until the end of their journey, with no recovery option if lost.

Block Diagram Description:

This projectis designed by following blocks

- Arduino Uno

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- GPS Module
- GSM Module
- RFID Card
- LCD display

CIRCUIT DIAGRAM

Components like the Arduino, GPS receiver, NODEMCU, shock module, and power supply are represented in the pin diagram. The Arduino is linked to the components using the available pins, as shown in the illustration below.

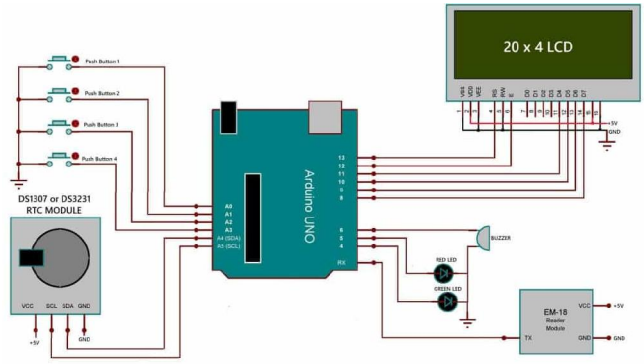

Figure 4.1: Circuit Diagram

ADVANTAGES

- **Cashless and Contactless Transaction:** Passengers do not need to carry cash, coins, or paper tickets. They simply use a prepaid smart RFID card or tag, which they tap upon entry ("Touch ON") and exit ("Touch OFF").
- **Automatic Fare Calculation:** The system automatically calculates the fare based on the exact distance traveled (start and end points) and deducts it from the user's account.
- **Faster Processing and Reduced Queues:** RFID readers scan cards quickly, often without needing a direct line of sight. This speeds up boarding and exiting, reducing congestion at stations and bus doors.
- **Enhanced Security and Reduced Fraud:** RFID tags contain unique, encrypted data, making them difficult to counterfeit. The system can instantly verify if a ticket is valid, preventing fare evasion.
- **Reusable Tickets/Cards:** Unlike paper tickets that are discarded after one use, RFID cards/tags are durable and reusable, significantly reducing paper waste and long-term costs.

APPLICATIONS

- Public Bus Transport**:** Automated fare collection where users tap in and out, allowing fares to be calculated based on distance, reducing reliance on cash, and eliminating conductor manual work.
- Metro & Train Ticketing**:** Seamless boarding in subways and train systems by enabling entry/exit gates to read pre-paid RFID cards.
- School & Employee Shuttles**:** Secured transportation for authorized students or employees, allowing attendance tracking and automatic gate access.
- City Tourist Shuttle Services**:** Efficient ticketing for tourist buses, streamlining access and enhancing the experience for visitors.

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IV. CONCLUSION

The conclusion of a Smart Ticketing System project using RFID technology focuses on the successful modernization of public transport by replacing manual, paper-based systems with an automated, contactless, and efficient solution. The project demonstrates improved operational efficiency, reduced passenger waiting times, enhanced security, and the elimination of ticket fraud.

This system 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 Node MCU 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.

The system is expected to be fully automated,reliable, transparent and convenient. The whole system can also be used in vehicle on highways, theirtoll payment and in the railway ticketing system with small or no modification. The cards being reusable, they are much more convenient compared to the paper based ticketing system. The card also can be used to be a universal travel pass card that will allow any transportation on any route. Any unwanted events can be avoided as all the person carrying RFID tickets are monitored every time they travel.

V. FUTURE SCOPE

Internet of Things (IoT) Integration: Future systems will go beyond basic ticketing to become fully operational IoT nodes. This includes real-time communication with a central server for monitoring, automatic data updating, and secure, instant transactions.

GPS-Based Dynamic Fare Calculation: Instead of manual switches or predefined zones, integrating GPS allows for precise calculation of distance travelled (boarding and alighting points), enabling dynamic, fair, and distance-based pricing.

Universal Travel Pass (Intermodal Mobility): The RFID card can be transformed into a universal pass usable across different transportation modes, such as buses, metro trains, suburban rail, and city trolleys.

Mobile App Integration & Digital Wallets: Future systems can replace physical RFID cards with mobile NFC apps, allowing users to check trip history, recharge, receive E-tickets, and receive real-time bus arrival notifications on their smartphones.

Enhanced Security & Safety Features: Integration of biometric systems (like fingerprint scanners) with RFID can prevent card sharing and misuse. Additionally, integrating cameras, fire sensors, or emergency alert buttons can enhance passenger safety.

Advanced Data Analytics: The system can analyse travel patterns to optimize schedules, manage fleet capacity, and predict demand, helping transport authorities reduce congestion.

VI. RESULT

Automated Ticketing: RFID tags act as digital tickets, allowing passengers to tap in and tap out (or swipe) to initiate and terminate journeys.

Automatic Fare Deduction: The system calculates fares based on distance traveled, automatically deducting the amount from a pre-paid user balance, often shown on an LCD.

Real-time Data Processing: Systems integrate Arduino or Raspberry Pi to manage card data, instantly validating users and updating records.

Improved Efficiency: Boarding times are significantly reduced, and manual ticketing errors are minimized.

Enhanced Security: The system prevents fraud by ensuring only valid cards allow entry, sometimes integrated with automatic doors/barriers.

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REFERENCES

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