International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

# RFID BASED BUS TICKETING SYSTEM

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**Abstract**—The main objective of this paper is to generate passenger tickets using RFID technology for the fare of a particular destination. The appropriate amount is deducted from the RFID card. In addition to that, in proposal system RFID has proven to be one of the most promising technologies in recent years and can be effectively employed in various applications since it is economical and widely used tool for tracking and locating purposes.Radio-frequency identification (RFID) is a technology that uses electromagnetic fields to automatically identify and track tags attached to objects .A small radio transponder, a radio receiver, and a radio transmitter make up an RFID system The RFID application, on the other hand, has become a popular tool for both tracking transit vehicles and the public ticketing system describes a design of IoT enabled real time bus tracking system There is an mobile app to recharge the RFID card.The message of money transaction is send to the users registered mobile number.The main aim of this project is to reduce the fraud in ticket transaction.The bus door will open only after scanning the RFID card.In this project we use IR sensor to detect the passengers entry and exit from the bus.When the passenger scan the RFID card then the LCD display shows the passengers information like their name,RFID card number,account balance.The ticket price is based on the distance travelled in the bus.This system also used to prevent the unfair ticket price for transportation.If the RFID card is missing then the passenger can able to block the RFID card to prevent unauthorized access.Public transportation is a significant role for methods among individuals.

**Key words**—Radio Frequency Identification System (RFID), Infrared sensor (IR sensor).

## I. INTRODUCTION

Public Transportation is a significant method for Bus among individuals. A new study by the National Sample Survey Organization says that 62-66% of individuals utilize transport as their method of transport. Individuals, over the long haul, hang tight for the transports at the bus station, since they didn't have a thought regarding transport running status, Since they can't get the area of the transport they will take some different methods of Bus to arrive at their objective. This work plan a public Bus global positioning framework for brilliant urban areas transportation and expects to give the moment the status of the transport to the clients through a computerized framework. This paper manages NodeMCU which fills in as the focal regulator going about as the cerebrum of the framework. To obliterate the manual log section and to mechanize the interaction this paper assumes a crucial part. Android cell phone application is picked as the medium to speak with travellers that give simple access. In this work following the transports, on the Blynk-IoT utilization of utilizing a cell phone, refreshing the travellers through constant warnings and improving the availability to the framework.

RFID is a Radio frequency Identification technology that has been used in many fields including solid waste management, human, animal, goods and object tracking and the several researches proved that the implementation and monitoring the RFID is very easy and it increases the efficiency of the system at a low cost. An automatic system is a one which doesn't need any external instructions by human beings instead of it acts according to the situation automatically. A Radio Frequency Identification Reader (RFID reader) is a device which is used to collect the information from an RFID tag, by using Radio waves. RFID is a technology similar to barcodes and somewhat extent to it. RFID has more advantages when compared to barcodes. RFID tag identifies the tag within the range of 3 to 300 feet. RFID technology scans the objects very quickly and enables the particular product, even when it is surrounded by several other objects.

## II. RELATED WORK

The simulation optimization methodology utilizes multi-objective with dependent and independent variables for optimizing the overall system performance. In simulation optimization, objective functions are designed to tackle battery consumption, Internet-of-Thing (IoT) network performance, cloud operations efficiency and smart scientific discipline integration. Simulation parameters are based on a real-time bus system which is further analyzed, filtered and adapted as per the needs of the system.In another analysis, supercharger's capacities are varied to evaluate the performance of the proposed system and identify the low cost and efficient smart transportation system. Simulation results show different scenarios for variations in the number of buses, charging stations, bus-depots, mobile charging facilities, and bus-schedules. Simulation results show that the average passenger's waiting time in the waiting is (after ticket booking) varies between 0.2 minutes to 0.7 minutes in real-time traffic conditions.

A novel machine learning approach dedicated to the prediction of the bus arrival times in the bus stations over a given itinerary, based on the so-called Traffic Density Matrix (TDM). The TDM constructs a localized representation of the traffic information in a given urban area that can be specified by the user. We notably show the necessity of disposing of such

data for successful, both short-term and long-term prediction objectives, and demonstrate that a global prediction approach cannot be a feasible solution. Several different prediction approaches are then proposed and experimentally evaluated on various simulation scenarios. They include traditional machine learning techniques, such as linear regression and support vector machines (SVM), but also advanced, highly non-linear neural network-based approaches. Within this context, various network architectures are retained and evaluated, including fully connected neural networks (FNN), convolutional neural networks (CNN), recurrent neural networks (RNN) and LSTM (Long Short Term Memory) approaches. The experimental evaluation is carried out under two types of different scenarios, corresponding to both long term and short-term predictions.

## III. PROPOSED METHODOLOGY:

RFID cards or tags are issued to passengers, containing unique identification information.RFID readers installed on buses are used to read the information from the cards or tags.RFID readers at bus entry and exit points validate passengers' cards during boarding and alighting.IR sensors is placed at the bus entry and exit points to detect the passengers entry into the bus and exit from the bus.Fare calculation is typically disance-based, with the RFID system recording the entry and exit points to determine the traveled distance.If the card is missing then the user can able to block the RFID card to prevent the unauthorized access.

Fig1. Node MCU

### RFID Module

The RFID reader is responsible for communicating with RFID tags attached to tickets or smart cards. It emits radio waves and receives signals back from the RFID tags, enabling data exchange. The reader typically interfaces with the central ticketing system to process ticket information. RFID tags are attached to each bus ticket or stored value card issued to passengers. These tags contain unique identification numbers or other encoded data relevant to the ticket type or passenger information.The RFID module interfaces with the bus ticketing system's central database or backend server via a communication interface, such as Ethernet, Wi-Fi, or cellular connectivity. This allows real-time synchronization of ticket data, passenger information, and transaction records for monitoring and analysis.


Fig2. RFID Components

### Controller Module

The core of the Arduino controller module is an Arduino microcontroller board, such as the Arduino Uno, Arduino Mega, or Arduino Nano. This board serves as the central processing unit, executing firmware programmed to control RFID readers, communication interfaces, user interfaces, and other peripherals.The Arduino controller module interfaces with RFID reader modules to communicate with RFID tags attached to bus tickets or smart cards. Compatible RFID reader modules, such as MFRC522 or PN532, can be connected to the Arduino board via SPI or UART interfaces, allowing the Arduino to read tag data and process ticket validations. The Arduino controller module incorporates communication interfaces, such as UART, I2C, or SPI, to communicate with external devices and systems. These interfaces facilitate real-time synchronization of ticketing data with central servers, payment gateways, and passenger information displays.

### Ticket Module

The ticket module utilizes ticket generation software to create unique RFID-enabled tickets or smart cards. This software may incorporate templates for different ticket types (e.g., single journey, daily pass, monthly pass) and encoding algorithms to generate unique identification codes or data for each ticket.The ticket module includes an RFID encoding device, such as an RFID writer or encoder, to program RFID tags embedded in bus tickets or smart cards with relevant passenger information, ticket type, validity period, and other necessary data. The encoding device ensures that each ticket is uniquely identified and authenticated by the bus ticketing system.The ticket module may integrate a ticket stock management system to track and manage inventory levels of RFID-enabled ticket stock. This system monitors ticket issuance, usage, and replenishment, helping bus operators

maintain adequate ticket supplies and prevent stockouts or overages.

### IR Sensor

IR sensors can be installed at the entrance and exit points of the bus to monitor passenger occupancy in real-time. By detecting when passengers enter or exit the bus, the system can provide accurate data on seat availability and help drivers and operators manage capacity more efficiently.IR sensors can trigger the opening and closing of bus doors automatically when detecting passengers approaching or departing. This automation improves passenger flow and reduces the need for manual door operation, enhancing convenience and safety for passengers.IR sensors can be integrated into surveillance systems to detect unauthorized access or suspicious activities on the bus.

### Communication Module

The communication module supports wireless communication protocols, such as Wi-Fi, Bluetooth, or Zigbee, to enable seamless connectivity between onboard devices, ticketing infrastructure, and central servers. These protocols provide flexibility and scalability for data transmission over short or long distances within the bus network.In addition to wireless options, the communication module may include Ethernet connectivity for wired communication between onboard devices and backend servers. Ethernet interfaces offer high-speed data transmission and reliable connectivity, making them suitable for bus ticketing systems deployed in fixed locations or urban areas with infrastructure support.

### Block Diagram

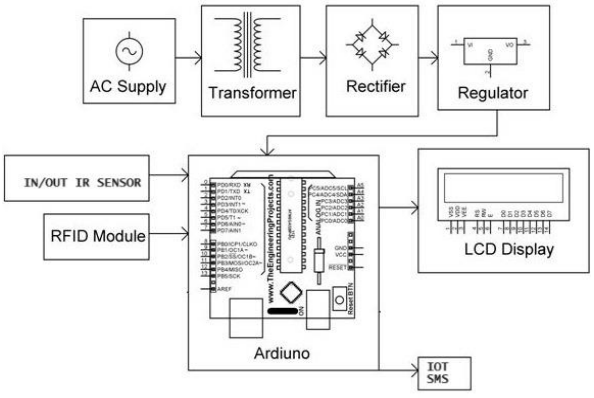


Fig 3 Block Diagram

### Power Supply

A power supply (sometimes known as a power supply unit or PSU) is a device or system that supplies electrical or other types of energy to an output load or group of loads. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.This circuit is a small +5V power supply, which is useful when experimenting with digital electronics. Small inexpensive wall transformers with variable output voltage are available from any electronics shop and supermarket. Those transformers are easily available, but usually their voltage regulation is very poor, which makes then not very usable for digital circuit experimenter unless a better regulation can be achieved in some way.

### Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled wires. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.A key application of transformers is to reduce the current before transmitting electrical energy over long distances through wires. Most wires have resistance and so dissipate electrical energy at a rate proportional to the square of the current through the wire. By transforming electrical power to a high-voltage, and therefore low-current form for transmission and back again afterwards, transformers enable the economic transmission of power over long distances. Consequently, transformers have shaped the electricity supply industry, permitting generation to be located remotely from points of demand.

### Rectifier

Rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as rectification. Rectifiers are used as components of power supplies and as detectors of radio signals. Mainly there are three types of rectifier i.e. half wave rectifier, full wave rectifier and Bridge Rectifier.A diode bridge is an arrangement of four (or more) diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input. When used in its most common application, for conversion of an alternating current (AC) input into a direct current (DC) output, it is known as a bridge rectifier. A bridge rectifier provides full-wave rectification from a two-wire AC input, resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a center-tapped secondary winding. The essential feature of a diode bridge is that the polarity of the output is the same regardless of the polarity at the input.

### Regulator

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload

protection all in a single IC. Although the internal construction of the IC is somewhat different from that described for discrete voltage regulator circuits, the external operation is much the same. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. A power supply can be built using a transformer connected to the ac supply line to step the ac voltage to desired amplitude, then rectifying that ac voltage, filtering with a capacitor and RC filter, if desired, and finally regulating the dc voltage using an IC regulator. The regulators can be selected for operation with load currents from hundreds of milliamperes to tens of amperes, corresponding to power ratings from milliwatts to tens of watts.

### RFID tag sensor

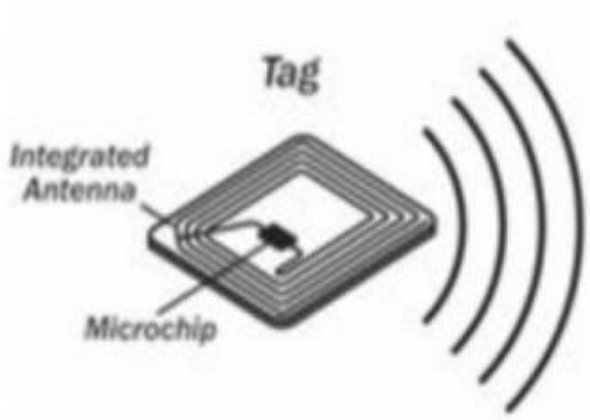


Fig 4. RFID Tag Sensor

An RFID tag (also referred to as a transponder) is an electronic device that communicates with RFID readers. An RFID tag can function as a beacon or it can be used to convey information such as an identifier. An RFID tag consists of (1) a small integrated circuit chip (2) attached to a miniature antennae, which is capable of transmitting a unique serial number to (3) a mobile or stationary reader in response to a query. A fourth important part of any RFID system is the database where information about tagged objects is stored.Every RFID tag has a unique identification number. The identification number includes not only the traditional information contained in a printed barcode (indicating manufacturer and product type), but also a unique serial number for that tag, meaning that each product or item will be uniquely identified.

## IV. RESULT AND DISCUSSION

The RFID-based bus ticketing system has proven to be a highly efficient and convenient solution for managing public transportation. By integrating RFID technology into the ticketing process, passengers can easily access buses without the need for physical tickets or cash transactions. This system ensures quicker boarding times, reduces fare evasion, and provides valuable data for transportation authorities to optimize routes and schedules.The implementation of an RFID-based bus ticketing system has resulted in significant improvements in public transportation efficiency and passenger experience. With RFID technology, passengers no longer need physical tickets; instead, they can simply swipe RFID cards or tags to board buses. This has streamlined the boarding process, reduced queues, and minimized fare evasion.

Additionally, transportation authorities have access to real-time data on passenger movements, enabling better route optimization and resource allocation.The adoption of RFID-based ticketing systems marks a paradigm shift in the management of public transportation. By eliminating the need for paper tickets and cash transactions, the system reduces operational costs associated with ticket printing and handling. Moreover, the convenience of RFID cards or tags encourages more people to use public transportation, contributing to reduced traffic congestion and environmental benefits.However, challenges such as initial setup costs and potential privacy concerns need to be addressed. While the initial investment in RFID infrastructure may be significant, the long-term benefits in terms of efficiency and revenue generation outweigh the costs.

## V. CONCLUSION

This proposal is based on the RFID technology-based bus ticketing system. The major goal of this project is to make extensive use of retarded technology. Reduce the amount of paper wasted. While many may argue that switching to paperless will be more expensive in terms of software and hardware needs than the previous paper-based system, a Smart Ticketing system has its advantages. The system should be totally automated, dependable, transparent, and user-friendly. With minor or no modifications, the entire system can be employed in highway vehicles, toll payment systems, and railway ticketing systems. Because the cards are reusable, they are far more convenient than paper based

ticketing system.The proposed system is implemented practically in the bus and the working is monitored and observed that it has maximum functional capability. The system gives the information of the person who is getting into bus, and time of inside and outside of college campus. It also gives the visitors who are getting inside the college campus, time and how many hours they will spend in the college. So that by using this system we can provide the security to the bus system, in future we are trying to implement the system which gives the name of the place. IoT based Public Bus worldwide situating work is a genuine procedure that can discover and

follow the vehicles. The achievement of the worldwide situating work lies in giving a straightforward interface utilizing an Android application to the customer.

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