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Automatic Bus Fare Collection System By Using GPS And RFID Technology

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Abstract: Today scenario the public transportation system is like the metro as well advanced. Passenger safety, convenience and the need to improve the performance of existing public transportation is driving demand for intelligent transportation system in the country. The paper based ticket system for collecting the bus fare has been found to be a source of major financial loss in India. It is difficult to assure the purchase of ticket by each and every passenger. A paper ticket becomes useless to the passengers when the destination is reached.And also conductor face difficulty to upload details of tickets purchase in a day. Sometimes malfunctioning also occurred. Even the count of many unsold tickets per day is very high. In the era of technology, India must focus on inculcating an automated system for collecting bus fare. Hence, this project proposes an automated card driven system using RFID and GPS for bus journeys in India. User can track the bus location of bus and count of passengers using the app.This project proposes the cashless money and paperless ticket.

Key Terms - RFID, GPS, Public transport, Bus Fare

I.INTRODUCTION

In Today sceneraio, everything in the world is smart and digitalized. Many advances have been made in the transportation sector too. However, public transport buses in India have always been an area where such new technology have turned their faces out. Work Intelligent vehicle for public transport is one of the research areas. Here global positioning system plays an important role to find positions. In certain urban areas there may be some errors to find the location so an alternative approach is visual milometer. Where vision based algorithms are proven to track the position of the vehicle over a long distance using sequence of images without prior knowledge about the environment. But the results have some disadvantages in alternate weather conditions so GPS holds best when compared to others. Control strategies based on expert rules and fuzzy logic are used to control the departure time, interval between two vehicles and delay occurred due to traffic. The parameters of fuzzy controllers were tuned through a particle swarm optimization algorithm. Another alternative approach to GPS is the use of PTN operator with positioning sensors to give on-trip personalized navigation information. Here unknown destination location for infrequent users can be found using positioning sensors. This proves to be a motivational driving factor for the public to prefer it over other modes of transportation. Mobile ticketing model comprises of a registered RFID TAG subscription either prepaid or post- paid. By scanning RFID TAG at the entrance or exit of the vehicle the traveler identity is known then according to the distance travelled by the passenger the amount is deducted from the RFID tag balance in the mobile. The affecting factor of this system is the use of smart phone. People with normal phone cannot use this technology.

II.EXISTING SYSTEM.

In general way, every bus is controlled by a ticket collector. The ticket collector will collect money from each passenger and issue ticket. Initially, printed papers or tokens are used as tickets. Nowadays, handheld machines are used to print tickets. This system has many disadvantages. The passenger have to carry the ticket till the reaching their stopping, the ticket collector should ensure that everyone has got the ticket, the time taken for ticketing is comparatively more and more amount of paper is needed to print the Ticket. For example, if a passenger wish to travel in bus. He has to carry money with them. Then ticket collector will collect the money and he will give ticket. This has to repeat for all passengers. This will take more time and waste of human resource as well as energy. The data relate to an AFC system integrated with an automatic vehicle location system that records a transaction for each passenger boarding a bus, containing attributes regarding the route, the vehicle, and the travel card used, along with the time and the location where the journey began. Some of these are recorded for the purpose of allowing on board ticket inspection but additionally enable innovative spatial validation features introduced by the methodology.

III.PROPOSED SYSTEM

Our proposed design can help us to avoid such kind of problem in our daily life. The proposed methodology introduces a Contactless Fare Media Technology (CFMT) and an Automated Fare Collection System (AFCS) to bring up the public transportation bus system in India to the world standard along with novel features. The prevailing ticketing system had many malfunction, malicious argument among public and corruption. It also aims to reduce fare-related fraud and revenue loss through open standard, secured transaction technology.

BLOCKDIAGRAM

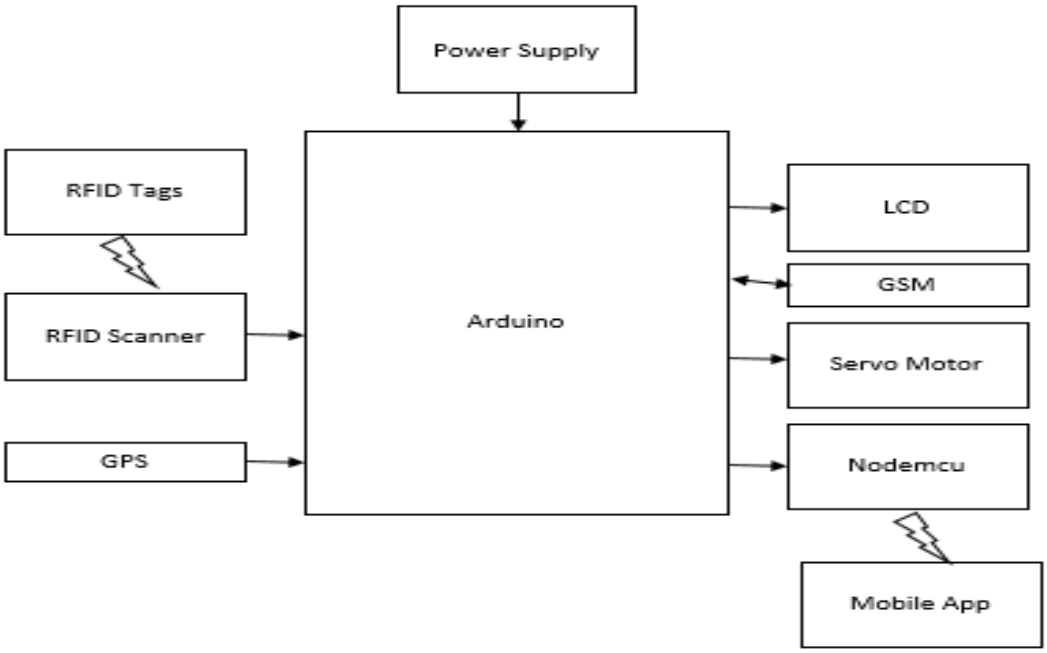
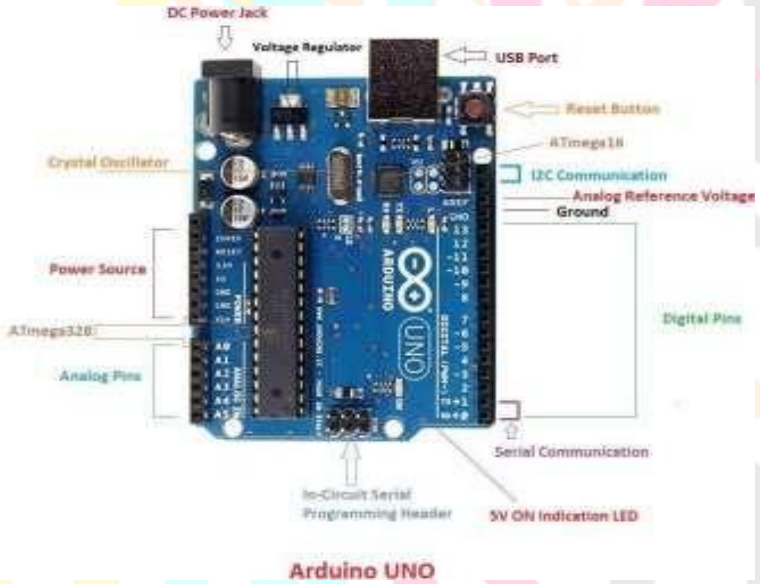


Fig 2: Block diagram of proposed system

HARDWARE ARCHITECTURE DISCRIPTION

Arduino uno:



The Arduino uno board is a popular open-source microcontroller board that is designed to be easy to use for beginners in electronics and programming. The board is based on the Atmega328p microcontroller chip and has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, and a power jack. The digital pins can be used for digital input/output, pulse width modulation (PWM), and communication with other devices via protocol such as SPI, I2C, and UART, Additionally, the analog inputs can be used to measure voltages within rages of 0 to 5 volts.

13KB of flash memory is used to store the number of instructions in the form of code. The board is powered up in three ways i.e USB, Vin pin the board or DC power jack. Arduino uno comes with built-in LED providing HIGH value when it gets turned ON and LOW when it gets turned OFF. Serial communication is carried out through two pins called pin 0(Rx) and pin (Tx). Here Rx pin for receiving data and Tx pin for transmitting the data.

NODEMCU:

The NodeMCU (***N***ode ***M***icro***c***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (Wi-Fi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

Servomotor:

A servomotor is an electromechanical device that is used to control the position of an object. It is a rotary actuator that uses acontrol signal to precisely control the speed and position of its output shaft. The servomotor consists of a motor, a gearbox, acontrol circuit, and a feedback mechanism.

The control circuit of a servomotor receives a signal from a microcontroller or other control device, which determines the positionand speed of the output shaft. The feedback mechanism, which is usually a potentiometer, provides information about the actual position of the shaft to the control circuit. The control circuit compares the desired position with the actual position and adjusts the output signal to the motor to achieve the desired position.

Servomotors are used in a wide range of applications, such as robotics, industrial automation, aerospace, and automotive industries. They are known for their high accuracy, precision, and repeatability, making them ideal for applications where precisecontrol of position and speed is required.

GPS:

GPS (Global Positioning System) is a satellite-based navigation system that provides accurate location and time information. Itis widely used in embedded systems for various applications, such as vehicle tracking, asset tracking, and navigation systems. GPS works by receiving signals from multiple satellites in orbit around the Earth. The GPS receiver calculates its position based on the time it takes for the signals to reach it from the satellites. The accuracy of GPS depends on the number and position of to stock

Fig7: GPS

In embedded systems, GPS is typically used in combination with other sensors, such as accelerometers and gyroscopes, to providemore accurate and reliable navigation information. The GPS receiver provides information about the device's location, while the other sensors provide information about its orientation and movement.

GPS is available in different formats, including modules that can be easily integrated into embedded systems. These modules typicallyprovide a serial interface for communication with the host device and can be programmed to provide different levels of accuracy and functionality.

GSM modules for embedded systems are available in different formats, including compact modules that can be easily integrated intoembedded systems. These modules typically provide a serial interface for communication with the host device and can be programmed to provide different levels of functionality, such as voice communication or data transmission.

LCD:

In embedded systems, LCD displays are a popular choice due to their low power consumption and ability to display clear, easy-to-read text and graphics. LCD displays typically require a small number of pins to control, making them well-suitedfor use in embedded systems with limited I/O resources.

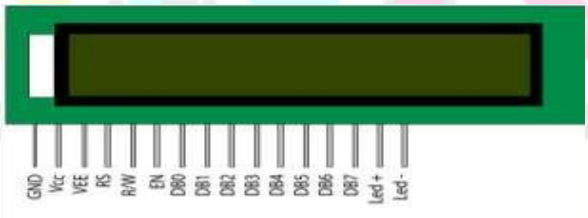


Fig: LCD Display

Passive matrix LCD displays are often used in embedded systems due to their lower cost and simpler design. However, active matrix displays can offer faster refresh rates and higher resolution, making them a good choice for more demanding applications. One challenge with using LCD displays in embedded systems is the need to manage the display's power consumption to avoid draining the system's battery. This can be achieved by controlling the backlight and adjusting the display's brightness based on ambient lighting conditions.

Another consideration is the physical size and durability of the display. Small, ruggedized LCD displays are available for use inharsh environments, while larger displays may require protective enclosures.

When selecting an LCD display for use in an embedded system, factors such as cost, resolution, and compatibility with thesystem's microcontroller or processor should be taken into account.

Arduino IDE:

The Arduino integrated development environment (IDE) is cross-platform application (for Windows, macOs, Linux) that is written in the programming language Java. It originated from the IDE for the languages processing, and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, bracematching, and synsthetichighlighting, and provides simple *one-click* mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

Flow Chart

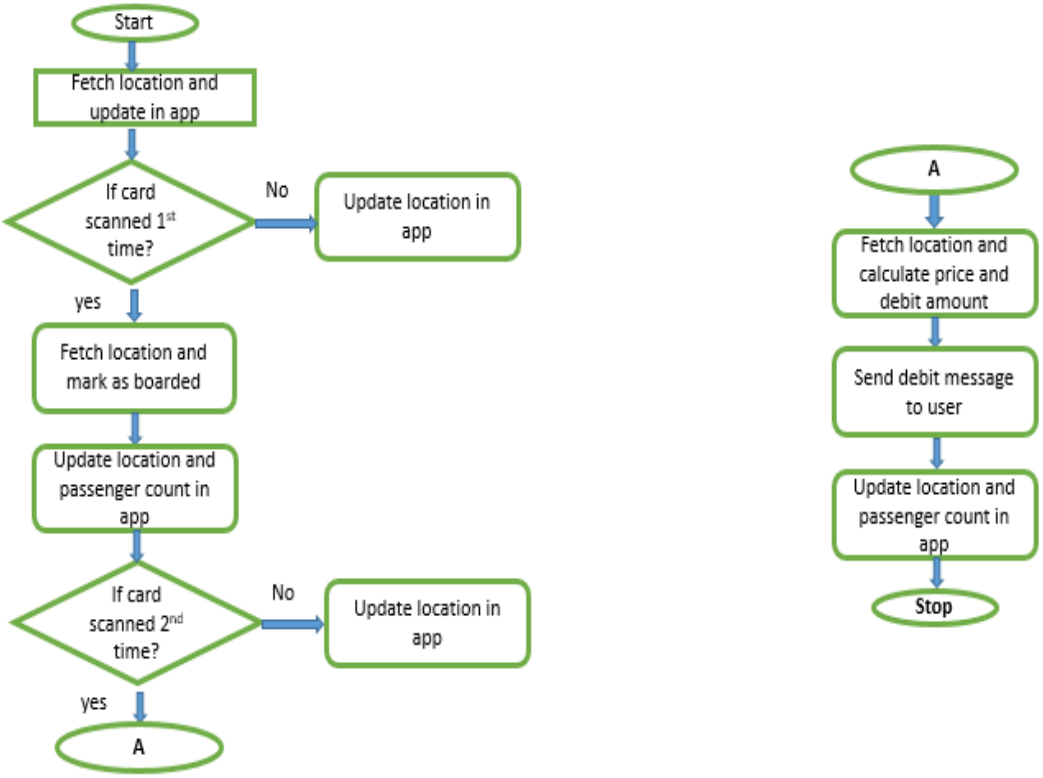


Fig 1: Flow chart of proposed system

RESULTS AND DISCUSSION:

Our proposed system designed automatic bus fare collecting by RFID. When entering & exit from bus fare can deducted from RFID tag which will every passenger should needed to travel in bus. Locations can be updated by iot cloud which is a application for passenger for live locations and count of passengers. When money deducted from tag message comes to mobile by GSM. RFID tag is rechargeable, if recharge is over it can recharge by near bus depot or retail shops.

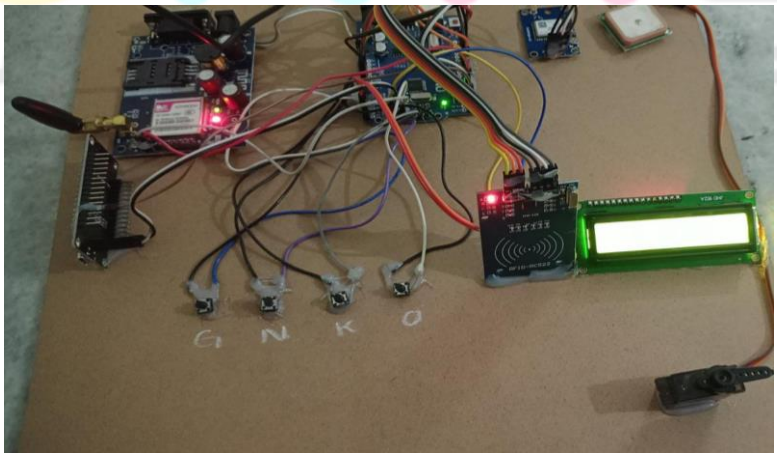
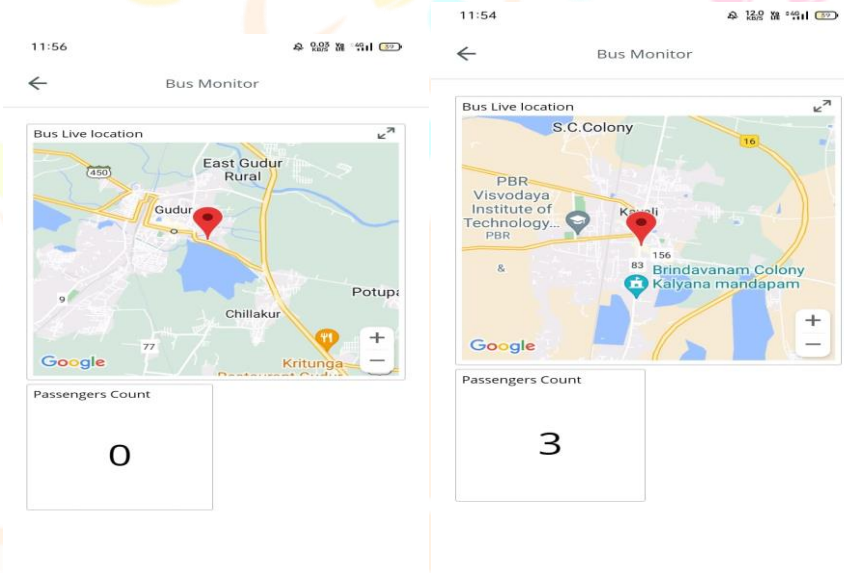


Fig : Circuit Connection

The above figure shows the connection of circuit . Automatic bus fare collection system it calculates bus fare by rfid tag with rfid scanner.

The above figure shows the messages sent by the gsm to the passenger while they reached the destination.



The above figure shows live location of bus and passengers count in the bus.

CONCLUSION:

The manual fare collection system has many issues which are overcome by our proposed system. Automated fare collection system for public transport is an innovative idea which reduces man power. It is believed that by implementation of these system problems such as underutilization of buses fleet will be reduced. So both passenger and bus station administrators will benefit from the system as Real time information are provided. The ticketing systems using RFID can be merged to solve the above mentioned problems. This project actually suggests a much more public friendly, automated system of ticketing with the use of RFID based tickets. This smart Embedded System can be implemented in the transport system, which will perform the fare collection automatically. This system is suitable for megacities like Chennai and Bangalore where a large no of customers avail public transport system daily and also users can live track the bus location and with number of seats occupied.

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