

# International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 8, Issue 3, March 2019

## Smart Bus Station Using Embedded System

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**ABSTRACT:** In the busy metropolitan cities, people don't have to invest in waiting for transport. This research involved the design and implementation of a smart bus station. In public transportation, there is a lack of real time information. The public transit usage can be improved if real time information of the vehicle such as seating availability, time taken to reach destination are provided with easier access. Overloading in the buses may some time leads to the accidents and fatal deaths due to foot boarding. We proposed an idea to over come this problem. Our project includes the upcoming buses which enters the station can be displayed in a LCD monitor and also be announced by the speakers using RF reader modules. It also includes counting of the passengers inside the bus using IR sensors. Here, we are using Arduino Uno and Arduino Mega boards respectively. If overloading of the passengers occurs, then immediately the bus number along with the bus details will be sent to the Control room using GSM module. The passenger counting system would be beneficial for passengers waiting in the bus station. It would also be helpful for the passengers to find the alternating choices depending on their circumstances.

**KEYWORDS:** Arduino uno, Arduino mega, GSM module.

### I. INTRODUCTION

The public transport available on sharing basis for the benefits of general public. It includes city buses, trolley buses, trams, passenger trains, ferries and rapid transit like metro and subbase. The main reason why the people choose public transportation over other modes of transport are its subsidized rates, environment-friendly attributes and easy accessibility. Firstly, public transport is very economical allowing the large population to have access to it. Using a bus or train to commute is comparatively cheaper than using a private car. If people have their own car they have to spend a lot of money on fuel, car servicing, repairs and insurance. Secondly, public transport can preserve the environment by reducing the amount of pollution. With an increase in the use of public transportation, there will be a reasonable dip in the number of private vehicles on the road, therefore improving the environment and in addition, solving the traffic congestion issues. The overloading of the Indian bus, by flouting there rules ignoring the safety norms is resulting in mounting road mishaps in the state. Along with the uncertainty in time, there is also an apprehension regarding the capacity of bus. Thus determining capacity of any given bus is equally important to the arriving time estimation. The increasing accident involving good vehicles is mainly due to overloading, rash driving and traffic congestion, according to MaheshChand, Chief project coordinator, National Transportation Planning and Research Center(NATPAC). In order to provide necessary bus data to all passengers, we propose a smart bus station where the incoming buses of the station will be displaced on the LCDs and announced by the speakers. An intelligent smart bus station removes the barriers for public transport usage and creates the positive impact about the bus journey.

### II. LITERATURE SURVEY

Mr. Pradip Suresh Maneet *al.*, implemented the proposed system Analysis of Bus Tracking System using GPS on Smartphone which focuses more on just Tracking the vehicle module. Wherein a mobile application is used to track the nearby Vehicles and also notifies about the nearby bus stops, so that the people can plan their route travel options accordingly. The inference drawn by this system is that the main focus is on the RFID module. This can be an ideal system as manual work is decreased by using artificial intelligence.

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**Madhu Manikya Kumaret al.**, implemented “Design of punctually enhanced bus transportation system using GSM and Zigbee.” The daily operation of public transport system, mainly that of buses, the movement of vehicles is influenced by different undetermined conditions as the day progresses, such as traffic congestion, unexpected delays, irregular vehicle send off to destination times and incidents. The bus arrival time showed by variable message sign reduces the anxiety of passengers. GPS and the ubiquitous cellular network helps in real time vehicle tracking for better transport management have become. On bus routes, knowledge of ridership data is pivotal for the efficient operational planning and quality of public transport companies. Automatic passenger counting (APC) can represent a powerful resource for supporting this activity, because it can provide a data bank of accurate counts. However there are some relevant challenges, such as data validation, matching of data to the bus stop, building intelligible performance reports and tackling anomalies must be faced in order to make APC data a mainstream source of information.

### III. EXISTING SYSTEM

Real time bus tracking systems are a group of modules that display the bus timings on the LCD screen of the bus stop. The system comprises of the power source, battery, LEDs, RF transceiver microprocessor, RF transceiver is installed over every bus that polls a signal that contains its GPS coordinates. The data will then be processed by the microprocessor. RF transceivers are installed at every bus stop to receive information regarding bus Coordinates. These will be passive circuits and will get active only when the transmitter enters the range of reception.

Also the existing system is not giving the density in the bus so that people cannot wait for bus instead of that people take alternative transport systems. On bus routes knowledge ridership data is pivoted for the efficient operational planning and quality and public transport companies. Automatic Passenger Counting can represent a powerful resource for supporting the activities because it provide a data bank of accurate counts. However there are some relevant challenges, such as data validation, matching of data to the bus stop, building intelligible performance reports and tackling anomalies must be faced in order to make APC data a mainstream a source of information. This paper proposes an offline framework for addressing these challenges. The use for setting bus frequencies is investigated in order to illustrate a possible application of the framework. The results are represented by Easy to read control dashboard composed of tables and graphs. The methodology is experimentally tested with data records provided by the bus operator CTM in Cagliari, Italy.

In our proposed android system any passengers who will board, it will be shown in the display monitor installed in the front of the bus. No manual counting could be needed. If there is no passengers on seat, it will show a blank seat. But when a passenger will be seated on the bus, it will be shown.

### IV. PROPOSED SYSTEM

The whole system divided into two sections. One is data transmitting section and another is data receiving section. These two systems are interfaced with RF Transmitter Receiver module. Here the data such as which bus enters the bus station and also whether the seat is available in the bus or not is transmitted to the RF receiver that is fixed at the substation where the passengers are waiting. Now the data that is received from the bus is connected to an audio system and also to a LCD display. Now we are already calculating the passengers count by using an IR sensor. If this value crosses a threshold value then the message is sent to a mobile phone using GSM Module. The message is sent to the control room so that they can increase the frequency of the buses based on the Requirement of passengers.

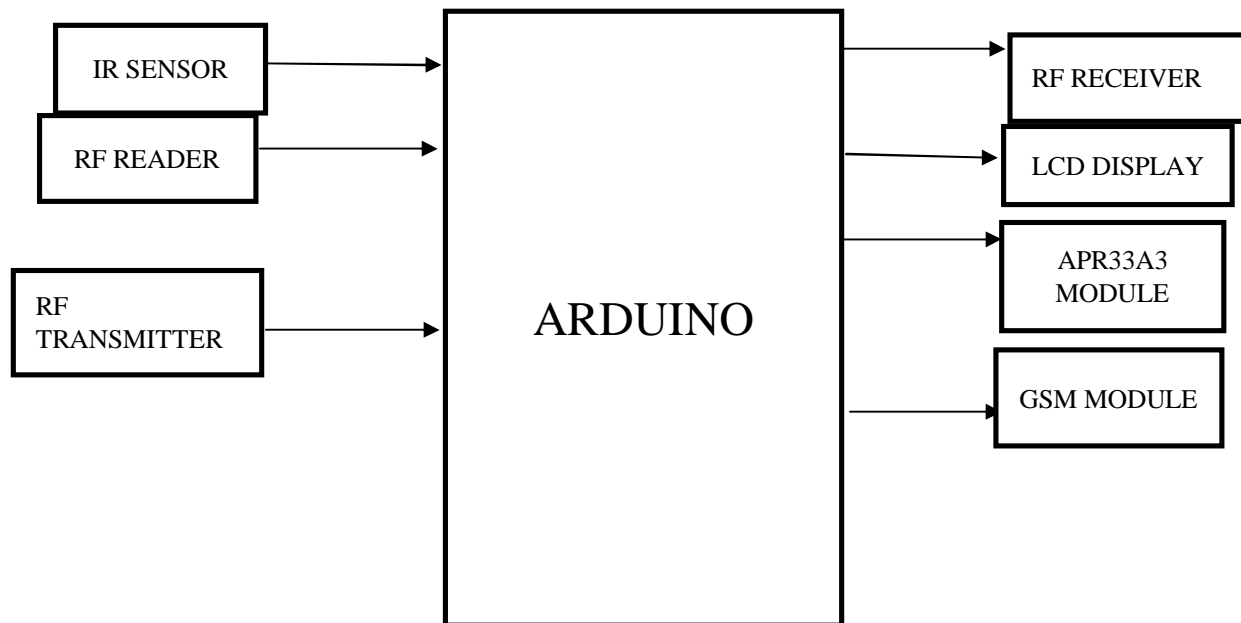
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### V. BLOCK DIAGRAM



#### 4.1 Transmission side:

##### 4.1.1 IR sensor:

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. They are used to count the passengers inside the bus. One IR sensor is placed at the entering footboard and another IR sensor is placed at the leaving footboard.

##### 4.1.2 Arduino:

It is a Microcontroller board that is used for storing and processing data. Here the sensor values are measured, stored and processed in the required format by uploading software code into it. We use two Arduino boards. One is Arduino uno and another is Arduino mega.

##### 4.1.2 Power supply:

Arduino requires power supply for working. Power supply is given using battery or by means of direct connection from supply board.

##### 4.1.3 RF reader module:

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. RFID is a technology similar in theory to bar codes.

##### 4.1.4 RF Transmitter:

In electronics and telecommunications, a transmitter or radio transmitter is an electronic device which produces radio waves with an antenna. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna.

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## 4.2 Reception side:

### 4.2.1 Arduino:

Arduino in the receiver section uses the transmitted data from RF Transmitter and process them into the required format such as input to the LCD display and speaker using APR33A3 module.

### 4.2.2 RF receiver:

An RF receiver module receives the modulated RF signal, and demodulates it. The receiver itself receives a radio frequency alternating current, which is applied to the antenna.

### 4.2.3 APR33A3 module:

There is a total 11 minutes of recording time and each channel (M0 to M7) having 1.3 minutes of recording time. It is a single chip, high quality voice recording and playback solution. It is user friendly and easy to operate. It uses non-volatile flash memory technology and no battery backup is required.

### 4.2.4 GSM Module:

GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.
2. Read, add, search phonebook entries of the SIM.
3. Make, Receive, or reject a voice call.

The MODEM needs AT commands, for interacting with processor or controller, which are communicated through serial communication. These commands are sent by the controller/processor. The MODEM sends back a result after it receives a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to interact with the GSM and GPRS cellular network. In our project we have used GSM Module.

## VI. RESULT

When the bus enters the bus station, the data is received by RF reader module such that every bus have their separate RF Id cards fixed at the side of the bus. This data is transmitted by the RF Transmitter to the Receiver. From the receiver the details of the bus are displayed through LCD and also through the speaker. This helps the blind people who are waiting for their bus to know whether their bus have entered the station or not. Now the seat availability is also displayed which is checked with the help of IR sensor. This data is also transmitted through RF transmitter. By using the same IR sensor the passengers count is calculated. If the passenger's count exceeds a predefined threshold value, then the GSM module sends a message to the control room that the bus to the particular route is overcrowded. Because of this information the frequency of the bus can be increased so that the passenger's waiting time can be reduced.

## VII. FUTURE SCOPE

Smart bus station will be very helpful for the passengers who are waiting in the bus station. If this project is implied, the blind people need not depend on others in the bus station. And also the frequency of the buses can be increased or decreased based on the passenger's requirement. Thus the waiting time of the passengers can be saved.

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In further development we can bring the safety to the passengers who are standing in the footboard of the bus which is very dangerous while travelling. This can be done by sending the message to nearby police by using GSM module if the passengers count crosses a very high value.

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