

# Study on Public Transport Overload Detection

Bagadkar K. Y.<sup>1</sup> Dabhade R. S.<sup>2</sup> Khorgade N.D.<sup>3</sup> Malkhede K.A.<sup>4</sup>

<sup>1,2,3,4</sup>Department of Electronics and Telecommunication Engineering

<sup>1,2,3,4</sup>P. R. Patil College of Engineering and Technology Amravati, India

**Abstract**— Announcement Majority of the public transport supportive system is not user friendly. An ambiguity on the available state of the transport bus may lead to poor performance of the supportive mechanism. The advancement of technology enabled, to meet the requirements of the supportive mechanism. There has been an issue of overload passenger monitoring despite having stationed police at different locations for manual checkups. This paper aims at developing a system for monitoring and reporting excess passengers in public transport. This paper includes GSM modem, liquid crystal display (LCD) and buzzer alarm as output from Arduino and passive infrared ray (PIR) sensor as input. If the number of passengers become above the required, the Arduino send data to the GSM modem. GSM modem transmit the information to a database and then to the respective authority such as traffic police. The central database stores all information for the system such as different traffic police stations with respective contact numbers, user name and message sent by the system. This helps to control excessive passenger, hence reduces the number of deaths and severe injuries. The public transit usage can be improved if real time information of the bus such as the seating availability, upcoming station information using digital display as well as audio system provided with easier access.

**Keywords:** Arduino Uno, IR Sensor, APR Kit, GSM Module, LCD, Piezo Buzzer

## I. INTRODUCTION

Carrying more passengers than capacity by bus has been a problem. Some other buses squeeze people in the spaces between the seats. Example a space of 4 passengers will accommodate 5 passengers. Why have passengers become agents and disciples of impunity in the bus industry? The worst part is that the money never reaches the owner it goes into the pockets of the drivers and the conductors. In the situation when someone complains or refuses to squeeze the conductor and some of the passengers

will tell them to buy their own car. The importance of controlling overloading passengers cannot be ignored because it helps to reduce deaths and casualties as the findings show that excessive passengers is one of the major causes of many deaths and casualties when accidents occur. Based on the statistics, approximately 27,000 civilians are killed in car accidents in some developing countries each year.

The main reasons 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 a large population to have access to it. Using a bus or a 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. There are many discounts available for some individuals,

like students and senior citizens who choose public transport as their transportation option to get to work or to school. 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 issue.[1]

## II. COMPONENTS REQUIRED

### A. Arduino Uno

Arduino is an open source computer hardware and software company, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or Breadboards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.[2]

### B. IR Transmitter and Receiver

IR transmitter and receiver are used to control any device wirelessly, for example in T.V remotes generally used as the IR receiver, which senses modulated IR pulses and convert them into electrical signal. IR transmitters generate IR rays of the required frequency specification. The IR receiver senses the IR rays and modulates these pulses into electrical signals.

### C. GSM Module

A GSM module is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection. A GSM modem can also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. GSM modem is usually preferable to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging.[4]

#### D. LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.[6]

#### E. Piezo Buzzer

A Piezo buzzer is an audio signalling device which produces sound based on the reverse of the piezoelectric effect. It consists of piezo crystals placed between two conductors and as soon as a potential is applied across these crystals, they will push on one conductor and pull on the other. This push and pull action will result in a sound wave. Most buzzer produce sound wave in the range of 2 to 4 kHz.

#### F. APR Voice Module

The circuit can record and play back the voice up to 30 seconds. It can be used in automatic answering devices, door phone etc. The IC APR 33A3 is provided with the circuitry capable of storing and reproducing the sound without using any microcontroller or some other software. No external ICs are required in the operation of the voice recording. If we use all these kinds of software the device may suffer from some virus, so by avoiding the use of microcontrollers and additional software we can able to operate the device free from errors. This process is based on Single-chip, and having high quality voice recording & Playback solution There are some numerous remunerations in using a voice recording which helps give us security when we wish to protect ourselves, it works as a prompt, and this application includes the processes like recording of conversation through different techniques through which they can record hours of conversations.[5]

### III. WORKING PRINCIPLE

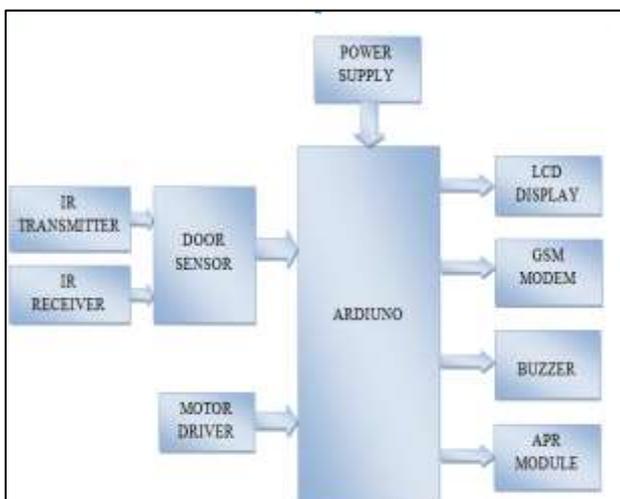


Fig. 1: Block Diagram of System

In this system will be the base module for the entire process which consists of Arduino interfaced with PIR sensor counter pair, 16x2 LCD display, and GSM modem and buzzer alarm with indicating lamp. LCD is used to display the number of passengers and number of extra passengers as well as the next Bus stop name. GSM modem sends the bus information to bus terminals like bus stop and bus station. Two pairs of PIR sensors (PIR 1&PIR 2, PIR 3 &PIR 4) are connected to the controller to count the number of passengers in and out.

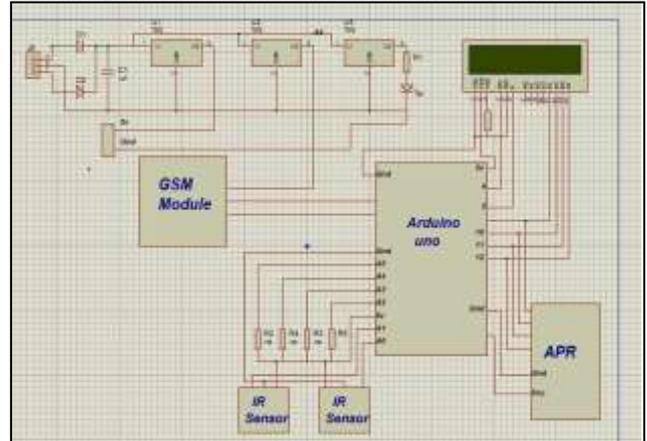


Fig. 2: Circuit Diagram of System

IR emission transmitters and receivers are used to count the number of passengers entering and leaving the bus. This gives the accurate number of passengers inside the bus so that overloading can be detected. This system will help reduce deaths and injuries in accidents involving buses with excessive passengers. IR sensors are placed at the doors of the bus. As a passenger enters the bus, the IR ray will be interrupted. Each time the IR ray is interrupted the count will go up by one. The program for counting the number of passengers will give the accurate number of passengers that has entered the bus. At any time if the number of passengers inside the bus happens to be more than the allocated number of seats on a bus, a buzzer will go on and ringing that is as an indication that the bus is overloaded. As soon as the extra number of passengers is unmounted from the bus through the exit door, the buzzer will stop ringing. If buzzer is continuously ringing and driver drives the bus after 30sec the message will send to the owner as well as the RTO office as "BUS IS OVERLOADED" by using GSM module. Fig represents the proposed block diagram for the overload detection system.

#### A. Seat Availability & Message Service

IR emission transmitters and receivers are used to count the number of passengers entering and leaving the bus. This gives the accurate number of passengers inside the bus so that also identified the seat availability in bus. IR sensors are placed at the doors of the bus. As a passenger enters the bus, the IR ray will be interrupted. Each time the IR ray is interrupted the count will go up by one. The program for counting the number of passengers will give the accurate number of passengers that has entered the bus and all this data stored in Arduino.[3] If any person who is in bus stop and send the message as code present in bus stop to the bus that time by using Arduino and GSM module give the

accurate numbers of seat availability to that person via SMS as well as the fare charge.

#### B. Announcement System

This module can be made using APR kit and IR sensor. As APR can record and play back the voice while IR sensor is use for giving signal. The transmitter is placed in bus and receiver is place in bus stop as well in near bus stop. A signals are continuously transmitting when the bus enters into the region of near to bus stop then receiver receives the signal as result give intimation of upcoming bus stop as display the upcoming bus stop name in LCD and announcing the upcoming bus stop. Similar process will happened when the bus enters in bus stop for announcement and displaying bus stop name.

#### IV. CONCLUSION

Overload monitoring system is becoming increasingly important and it is more secured than other systems. It is completely integrated so that once it is implemented in all vehicles, then it is possible to control. By using ARDUINO, PIR sensor and GSM modem we can control the overloading of transportation system. Controlling method in this paper can reduce crowdedness and car accident in public transportation. If the number of people inside the bus is above the required, the buzzer alarm starts sounding. The GSM modem automatically sends the message to the bus station module and bus stop module, and so the driver will punish according to the rule. Mainly this system is beneficiary for a new person who doesn't know about the city as display and Announcement is present there. This system has many advantages such as large capability, wide areas range, low operation costs, effective, Strong and system becoming smarter.

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