# Smart Public Transport Assistance For Smart Cities


## Abstract:

The smart public transport assistance system will help the passengers as well as the driver of the buses by providing information about the bus in an exact manner. It will automatically register the arrival and departure time of the bus in the bus stand using the RFID technology and the database of the registry can be viewed at the bus depot by the drivers whenever it is needed. Also, the system provides solutions to know if the buses are congested using a sensor located inside the bus. The website shows the levels of crowding in the buses. It gives the live location of the bus to the people that can be viewed through the websites or dashboards in the bus terminus. This system will make public transport, an intelligent and easy to use the system. Thus, the website motivates the passengers to use public transportation which may solve the issues of growing fuel consumption, emergent traffic overcrowding.



### Keywords:

(RFID technology, IR sensor, GPS, Arduino, Smart buses)


## Introduction

A smart city is an urban region that is highly advanced in terms of overall infrastructure, enriched with high-end technology, using reliable communications and smart security keeping in perspective the market viability. The concept of creating a Smart City is now made easy with the extensive development of the Internet of Things. With the rapid growth of population in urban areas there is an urgency to shift towards technological solutions to cater the needs of smart cities. Currently, the south Indian transport systems are only under manual processes. There are no prevalent mechanisms for knowing the particular locations or timings of a bus at a exact instance. Also, in the current applications, there is of lack of information about the accurate number of people in a particular bus. The smart transport system is a cloud-based GPS tracking system incorporating a prediction algorithm to provide minute-to-minute bus service information. The system knows at any given point of time where a bus is and can predict the bus arrival time at any bus stop. This technology enables the travelers with real-time passenger information like the availability of seats of particular bus service, the location of the bus, via websites and bus stop displays. The RFID technology is used for the register of entry and exit of the buses in the bus depot in every bus stands automatically and it can be viewed by the drivers of the buses whenever needed.

## Block Diagram:

### Working Principle:

### Location Specification Module:

The location specification module is designed to provide the instantaneous location of the

desired bus to the user through GPS integrated in the smart device. The geolocation feature is enabled in web site. The satellite transmits the GPS data to the server.The GPS data is retrieved by the user through the websites to view the exact location of the bus. The transmission of data takes place at a particular interval of time. Through this, the user can avail reliable and time-saving travel which stands as the biggest discomfort with conventional public transport.

## Counter Module:

The smart device also serves the purpose of a counter that transmits the head count data in the preferred bus to the server. Once the commuter gets in the bus, the count will be increased in the entry side and count will be decreased in the exit side by use of IR sensor. The application user can view the exact number of commuters who are travelling in a particular bus by retrieving the count value from the server using website.

## Administrator Module:

The administrator logs into the system using unique username and password. Admin has the access to view the details of the bus.The RFID tag given for each bus will be scanned with the RFID reader and the details will be registered in the database of the admin.

## Components:

- Arduino(ATMEGA328p):
- 16×2 LCD display
- GPS
- IR sensor
- Power supply

## ARDUINO(ATMEGA328p):

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features: 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due which operates with 3.3V. The second one is a not-connected pin, that is reserved for future purposes. Stronger RESET circuit. Atmega 16U2 replace the 8U2.

## 16X2 LCD Display:

A liquid crystal display (LCD)’s technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. LCD technology is used for displaying the image in notebooks or some other electronic devices like mini computers. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image. This image is then displayed on the screen.

**Features of 16×2 LCD module:**

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

## LCDs Work:

The principle behind the LCD’s is that when an electrical current is applied to the liquid crystal molecule, the molecule tends to untwist. This causes the angle of light which is passing through the molecule of the polarized glass and also cause a change in the angle of the top polarizing filter. As a result a little light is allowed to pass the polarized glass through a particular area of the LCD. Thus that particular area will become dark compared to other. The LCD works on the principle of blocking light. While constructing the LCD’s, a reflected mirror is arranged at the back. An electrode plane is made of indium-tin-oxide which is kept on top and a polarized glass with a polarizing film is also added on the bottom of the device. The complete region of the LCD has to be enclosed by a common electrode and above it should be the liquid crystal matter.

## GPS:

Firstly, the signal of time is sent from a GPS satellite at a given point. Subsequently, the time difference between GPS time and the point of time clock which GPS receiver receives the time signal will be calculated to generate the distance from the receiver to the satellite. The same process will be done with three other available satellites. It is possible to calculate the position of the GPS receiver from distance from the GPS receiver to three satellites.

However, the position generated by means of this method is not accurate, for there is an error in calculated distance between satellites and a GPS receiver, which arises from a time error on the clock incorporated into a GPS receiver. For a satellite, an atomic clock is incorporated to generate on-the-spot time information, but the time generated by clocks incorporated into GPS receivers is not as precise as the time generated by atomic clocks on satellites. Here, the fourth satellite comes to play its role: the distance from the fourth satellite to the receiver can be used to compute the position in relations to the position data generated by distance between three

satellites and the receiver, hence reducing the margin of error in position accuracy.

### IR Sensor:

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human’s visionary senses, which can be used to detect obstacles and it is one of the common applications in real time.

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.

### LED (Light Emitting Diode).

In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is used as a comparator circuit.

When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus the output of the comparator (LM 339) goes high and the LED starts glowing. Resistor R1 (100 ), R2 (10k ) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k ) is used to adjust the output terminals. Resistor VR1 (preset=10k ) is used to set the sensitivity of the circuit Diagram. Read more about IR sensors.

## Power Supply:

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power.

It contains a step-down transformer, rectifier, filter capacitor, and a bleeder resistor. This type of power supply, because of simplicity, is the least costly and most reliable for low power requirements. The main disadvantage is that the output voltage is not constant. It will vary with the input voltage and the load current, and the ripple is not suitable for electronic applications. The ripple can be reduced by changing the filter capacitor to an LC (inductor-capacitor) filter, but the cost becomes more.

## Conclusion:

With the implementation of the project, a complete track can be kept of the buses of the college. The display at the passenger’s end acts as a time saver. Due to this, an ideal system of bus

transport is established by us for college purposes. By implementing our system, a passenger can plan their journey more efficiently before time as the waiting time at the bus stops is reduced. This system also throws light on the frequency of the buses on the same route. The main features of this system are the efficient usage of time, real-time information on the availability of buses, traffic acknowledgment, and commuter satisfaction. A general question that arises in mind is if the bus is stuck in traffic or it broke down somewhere in the middle how our system will inform the traveler. The answer to this problem is that when a user will query the central server, the server will show the same location and ETA of the bus as previous so by this method, it is self-explanatory that the bus must have got stuck in traffic or there might be an unknown problem with it. Thus in this system, we have shown that transit information collected in real-time can be shown on the server for tracking and monitoring. Internet-enabled mobile phones can receive real-time transit information and will help passengers to monitor their time more effectively and precisely.

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