ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

# Automatic Vehicle Tracking for Public Transport in Smart Cities

M. Shanmugham[1], P.V.Bavanyaa[2], P.Gobiga[3], B.Gowtham[4], P.Janani[5]

Assistant Professor, Department of Electronics and Communication Engineering, Builders Engineering College, Tirupur, Tamilnadu, India[1]

UG Scholar, Department of Electronics and Communication Engineering, Builders Engineering College, Tirupur, Tamilnadu, India [2,3,4,5]

**ABSTRACT**: In public transportation, there is lack of real time information. The public transit usage can be improved if real time information of the vehicle such as the seating availability, current location and time taken to reach the destination are provided with easier access. It would also be helpful for the passengers to find alternate choices depending on their circumstances. As excessive long waiting often discourage the travellers and makes them reluctant to take buses. A smart information system has been proposed where the travellers get prior information about current location, next location of bus and crowd level inside the bus. This system is designed using ARDUINO UNO, IR Sensor and Wi-Fi Module. An Intelligent Transport System (ITS) removes the barriers for public transport usage and creates the positive impact about the bus journey.

**KEYWORDS:** public transportation, crowd density, smart information, Wi-Fi.

## I. INTRODUCTION

Public transport is a service available on sharing basis for the benefit of general public. It includes city buses, trolley buses, trams, passenger trains, ferries and rapid transit like metro and subways. 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. There is always an uncertainty regarding the arrival of a bus. Often, buses break down causing further problem to commuters. Another pitfall we see is that public transportation often lacks organization. Commuters are often confused with regards to bus routes and bus stops. Even if the buses are running on time, they are usually crowded, the reason- being, less frequency of the buses. Since the ratio of the buses to the population availing public transportation is disproportionate, overcrowded buses are not a rare sight.

In public transportation, there is lack of information about the arrival time. Along with the uncertainty in time, there is also an apprehension regarding the capacity of a bus. Even if the passenger is aware about the arrival time of the bus, they do not know how many additional people can be accommodated inside the bus. The information will be half-baked and hence of no use. Thus, determining capacity of any given bus is equally important to the arrival time estimation. As excessive long waiting often discourage the travellers and makes them reluctant to take buses.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

In order to provide necessary bus data to all passengers, we propose a Smart information system where all relevant information of the bus will be gathered, processed, and presented to the user through the LCD at every bus stop and also track the bus in a website. In this smart information system, the travellers get prior information about current, next location of bus and crowd level inside the bus. This system is designed using Arduino UNO, IR Sensor, GPS Module and IoT module. An Intelligent Transport System removes the barriers for public transport usage and creates the positive impact about the bus journey.

## II. RELATED WORK

An automatic system for low-cost,real-time tranist tracking and arrival time prediction is presented.several steps are used to produce the output. Structured model gives the passenger counting and tracking based on the complex method. Petri nets were developed and client server algorithm is used[1].

Different types of passenger counting is given like profile measuring technologies, passive infrared technologies, 3D sensors[2].

GPS technology to obtain the location of the buses and to connect it to internet by a general-packet-radio service (GPRS) technology for displaying a real-time update on the web-map by Google which allows all time tracking of buses. The GPS- module will detect the buses using satellite, and the GPRS- module will collect the data and transfer it to the website[3].

WiLocator, to track and predict the arrival time of an urban bus based on the surrounding WiFi information collected by the commodity off-the-shelf (COTS) smart phones of bus riders, the mobility constraint of a bus and the temporal consistency of travel time of buses on the overlapped road segments[4].

## III. EXISTING SYSTEM

The existing system is a structural model passenger counting and public transport tracking system of smart city and structural model based on the method of complex discrete systems simulation Petri nets are developed in the article. Reach ability graph of the system states that allows to investigate the dynamics of the system is given. The functioning of the implemented system of passenger traffic and public transport tracking were given in a block diagram.

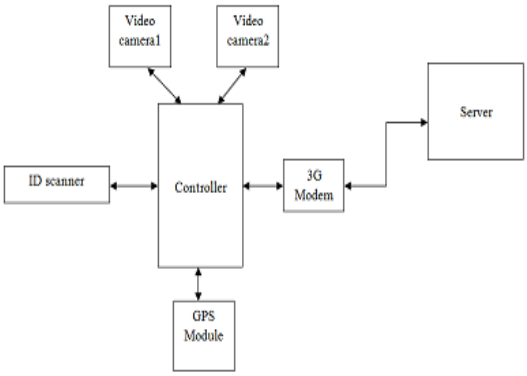



**Figure 3.1 Block Diagram**

## IV. NEED FOR BUS TRACKING

Main objective of GPS based bus tracking systems is to get real time location coordinates of the bus, seat availability in the bus and the bus arrival time so that passengers can make better travel decisions and also to make user friendly system to track location and get approximate bus arrival time. Such a system could also be used by

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

parents to track the location of the bus of their children. Main effects of such a bus tracking system are reduced wait time, reduced uncertainty time, allows for comfort travelling, ease of use, and greater feel of security, increased willingness to pay and customer satisfaction.

## V. PROPOSED SYSTEM

In this paper we present the smart information system shown in figure 5.1 and 5.2 which will allow then travelers to take alternative transport choice by tracking providing information about location of the bus and crowd level inside the bus.

The vital components of this system are Arduino UNO, GPS, IR sensor, zigbee transceiver, Wi-Fi module. Inside the bus Wi-Fi module and two IR sensors were used. IR sensor is used to count the passenger. Information from the sensors and the location were sending to the Wi-Fi module and uploaded inside the bus. And for the passengers at the bus stop get the information in the LCD display through zigbee transceiver.

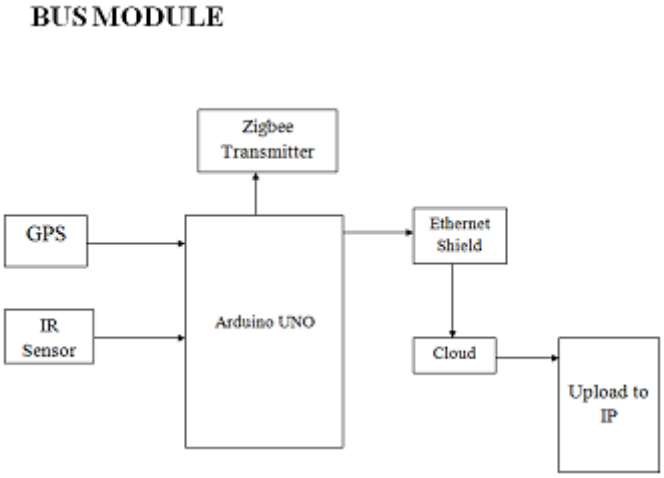



**Figure 5.1. Block Diagram-Bus Module**

The display unit consist of zigbee transceiver, arduino UNO and 16x2 LCD display. The zigbee transceiver will receive the information from the bus, process with arduino UNO and display using LCD.

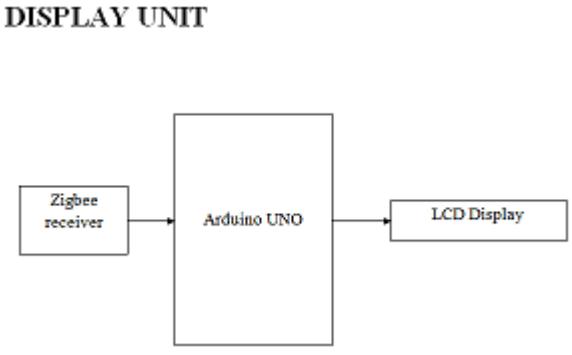



**Figure 5.2.Block Diagram-Display Unit**

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

## VI. SYSTEM ARCHITECTURE

The Embedded device in the bus collects the information of bus related to its location and time and gives out the information about arrival time, current location and vacant seats available in the bus, for this purpose Arduino Uno is used.

### 6.1. BUS MODULE

#### 6.1.1.GPS

To detect current location of vehicle GPS is used to interpret the coordinates of the vehicle. A GPS navigation device or GPS receiver is used for vehicle navigation. It is the device that is capable of receiving information from GPS Satellites and then to accurately calculate its geographical location. It can retrieve from the GPS System Location and Time information in all-weather conditions, anywhere on earth. A GPS reception requires an unobstructed line of sight to 4 or more GPS satellites.

#### 6.1.2. IR SENSOR

Infrared sensor is a electronic device, that can measure the heat of an object as well as detects the motion. This sensor is used to detect any human crossing entrance and exit path of the bus. These signals are processed by our embedded system. The bi-directional counter is used which senses the human hindrance and increments the counter each time, when Infrared signal is cutoff at the entrance. This embedded system also receives the signal from the exit points which is used to decrement the counter. This counter provides us real time estimation of density of people who are inside the bus. In our project two IR sensors are used namely IR1 at entry side and IR2 at exist side. When the IR1 cut off the counter gets incremented by 1 and IR2 cut off the counter gets decremented by 1.

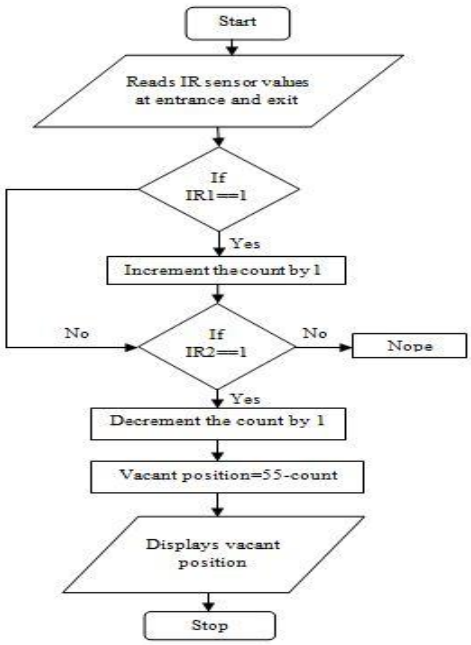



**Figure 6.1.2.1.Flowchart for IR sensor**

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

### 6.1.3. Wi-Fi MODULE

From hardware perspective, it incorporates microcontroller, MAC, baseband, and RF front end. The data is transmitted and received over radio frequency. From software perspective, it implements most of the 802.11 MAC protocols broadcasting. In this project we use ESP8266 Wi-Fi

### 6.1.4. ZIGBEE TRANSCEIVER

Zigbee is a low-cost, low-power, wireless mesh network standard targeted at battery powered devices in wireless control and monitoring applications. Zigbee delivers low latency communication. Zigbee chips are integrated with radios and with microcontrollers. In this project we use data zigbee which operates in 2.4GHz to transfer the data's like name of the bus, arrival time of the bus, and seat availability within the bus to the display unit in the bus stop. Data rates vary from 20 kbit/s to 250 kbit/s.

### 6.1.5. WEBSITE

The passengers who were not at the bus stop can also track the information of the bus using the website https://app.ubidots.com/accounts/signin/ with login id and password. Passenger count, name and location of the bus were also updated to the website.
Ubidots is an IoT platform were we can easily connect hardware and data sources to the cloud.

### 6.2.DISPLAY UNIT

### 6.2.1 ARDUINO UNO

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button. This contains all the required support needed for microcontroller. Simply connect it to a computer with a USB cable are power it with a AC-to-DC adapter or battery to get started. It communicates using the original STK500 protocol.

### 6.2.2 LCD DISPLAY

A 16x2 LCD is used for displaying location values. A 9v battery is used to power up the circuit. These modules are preferred over seven segments and other multi segment LEDs. It can display 16 characters per line and there are two such lines.

## VII. IMPLEMENTATION

The separate power supply unit provides about 5v to the bus module and to the display unit. The GPS gives the location of the bus, here we take latitude and longitude of fixed stops and attached to the program. While the bus starts GPS starts locating the bus. Meanwhile the location of the bus was updated to the website. Once the GPS reach the fixed stops position it will send the data's like name and arrival time of the bus along with the seat availability. The seat availability can be calculated by the counter using two IR sensors placed at the entry and exit of the bus. These information were transmitted through the data zigbee at the bus module to the display unit. The zigbee at the display unit receives the data from the bus module and process the data by arduino UNO and display using 16x2 LCD display.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

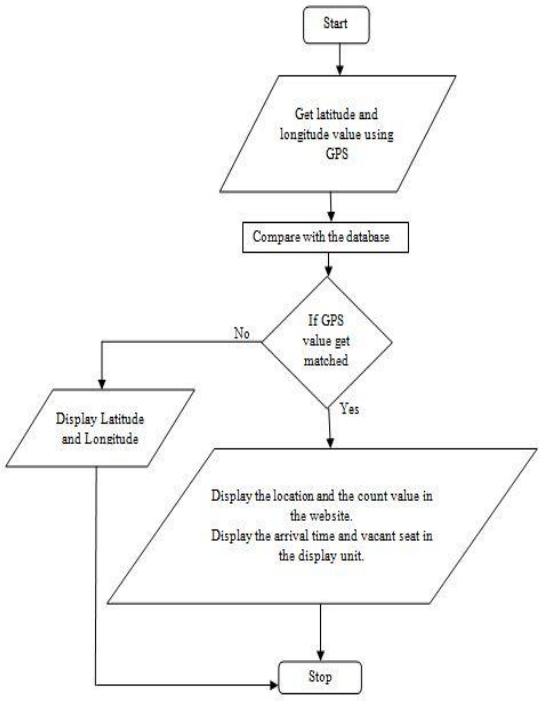
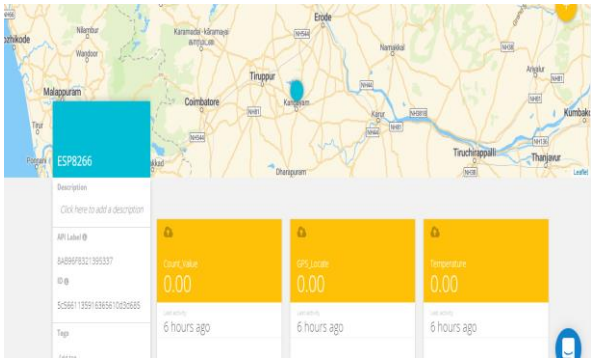



**Figure 7.1 Flowchart for System Implementation**

## VIII. RESULTS AND ANALYSIS

This system provides information about name, arrival time, seat availability of the bus and transmits the information to the display unit. The people outside the bus stop can also track the bus location and people count using a website. It would also be helpful for the passengers to find alternate choices depending on their circumstances.




## IX. CONCLUSION AND FUTURE WORK

In this paper a smart information system is presented for the passengers that have the ability to interconnect passengers with real-world public bus. The information system allows handicapped people to take alternative transport choice by providing seat availability and arrival time.

In future, the system can be upgraded by providing Toll free number to provide the in formations like location, seat

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

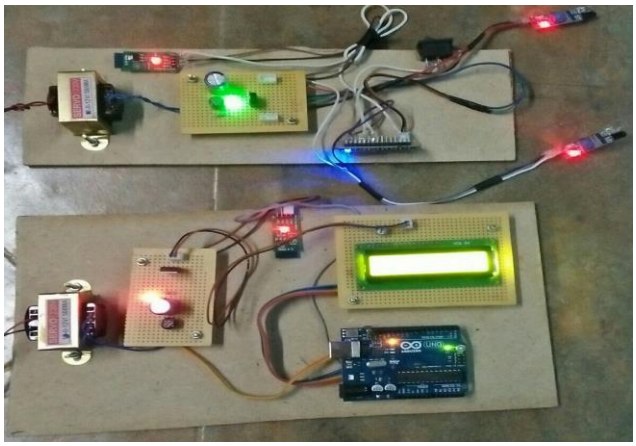
International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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

*Website: www.ijareeie.com*

**Vol. 8, Issue 2, February 2019**

availability, arrival time, name of the bus without internet access.



## REFERENCES

[1]O. Boreiko and V. Teslyuk, "Structural model of passenger counting and public transport tracking system of smart city, "XII International Conference on Perspective Technologies and Methods in MEMS Design (MEMSTECH), Lviv, 2016, pp. 124-126, April-2016.
[2] S. Sharad, P. B. Sivakumar and V. A. Narayanan, "The smart bus for a smart city — A real-time implementation," IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), Bangalore, 2016, pp. 1-6.
[3]W. Liu *et al.*, "WiLocator: WiFi-Sensing Based Real-Time Bus Tracking and Arrival Time Prediction in Urban Environments," 2016 IEEE 36th International Conference on Distributed Computing Systems (ICDCS), Nara, pp. 529-538, 2016.
[4]L. Singla and P. Bhatia, "GPS based bus tracking system,"2015 International Conference on Computer, Communication and Control (IC4), Indore, pp.1-6, 2016.
[5]N. Bernini, L. Bombini, M. Buzzoni, P. Cerri and P. Grisleri, "An embedded system for counting passengers in public transportation vehicles," 2014 IEEE/ASME 10th International Conference on Mechatronic and Embedded Systems and Applications (MESA), Senigallia, pp. 1-6, 2014.
[6]Ajay Shingare, AnkitaPendole, Nikita Chaudhari, Parikshit Deshpande and Prof. SamadhanSonavane, "GPS Supported City Bus Tracking & Smart Ticketing System", in 978-1-4673-7910-6/15/$31.00c 2015 IEEE