Arrival Time And Seat Availability Prediction System For Public Transit

Sonali B. Magar
Dept. of E &TC Engineering,
SND College of Engineering & RC,
Babhulgaon, Yeola, Maharashtra
India.

Prof R. G. Dabhade
Dept. of E &TC Engineering,
SND College of Engineering & RC,
Babhulgaon, Yeola, Maharashtra

Abstract

The proposed system focuses on enhancing the usability and productivity of existing bus transportation system in Indian cities. In this technology has a role to play for completion of the goal by means of providing an effective solution by establishing a wireless communication network in the city. This introduces a framework as an improvement to the existing city bus public transport system in India - Arrival Time Prediction of bus and approximate Seat Availability in the bus. Zigbee and GSM Technologies can be utilized to establish a wireless network among Buses, Bus Stops and Central Bus Stand in order to establish this interconnection. Zigbee modules used for short-range communication and Long-range communication are established using GSM messaging. The improvements in the system are expected to encourage more people to use public transport in order to overcome the problem of traffic. Excessive fuel consumption is also problem in many aspect this also get reduced.

Keywords- **GSM, LCD Display, Bus.**

I.INTRODUCTION

Transport is one of the important infrastructures of any city. The main problem about the transportation is the uncertainty of waiting time due to traffic jams and any other issue live abnormal conditioning. In the Existing system,

Different tracking techniques are used such as integration with Google maps, Automatic transit directions or real time tracking and arrival time prediction. Alerting system uses GSM for Sending information; GSM is used to inform the bus stop about exact location of vehicle. Transport has a major impact on the quality of life in a major city, its environment and the economy. Transport Authorities globally facing similar strategic challenges around worsening congestion, insufficient transport infrastructure, increasing emissions and growing customer needs [4]. The main aim of using advanced technologies in transport is to alleviate existing concerns including traffic congestion, air and noise pollution [1]. Objective is to reduce traffic congestion, financial costs, and other environmental damages. It is necessary to conduct further research on the various characteristics of traffic flow patterns. Our objective is to increase the efficient passages of every vehicle, while at the same time reduce the number of vehicles on the street [6]. Real time traveller system, occupancy system, bus traveller information system, congestion management system is important researchers area in urban transport [7]. The rapidly increasing vehicle population, spurred by the population boom and economic upturn lays a critical burden on traffic management in the metropolitan cities [2]. The Flexible Bus Systems is also one option which means a system that can replace the Traditional Bus Systems with its flexibility and efficiency. In this the use of wireless technologies in the flexible bus systems and how to make it more reliable using short range wireless technology Zigbee [5].For transit tracking and travel time finding different sensors used and different connectivity used like Wi-Fi, Bluetooth, Zigbee, GSM, GPS techniques [3]. Below is the comparison of technologies, which justifies the selection of Zigbee for the intended application.

TABLE I
Comparison between Short Range Wireless Technologies

Parameter	**Zigbee**	**Wi-Fi**	**Bluetooth**
System Resources	50 to 60 Kbyte	More than 1Mbyte	More than 250Kbyte
Battery Life (days)	More than 1000	1 to 5	1 to 7
Network Size	65535	32	7
Bandwidth (Kb/s)	20 to 250	11000	720
Transmission Range (m)	100	70	10
Success Metrics	Reliability, Power	Speed, flexibility	Cost, Convenience
Application	Monitoring and Control	Web, Heavy data transfer	Cable Replacement

II SYSTEM ASPECTS AND DESIGN DETAILS

The system is divided into 3 different modules. It consists of Bus Module, Control and Communication Module at Bus Stop and Central Server

A) Block Diagram for Bus: In the bus we are using microcontroller, IR sensors, Zigbee Module, GPS module and power Supply. Here we are using Battery supply for microcontroller and to the related hardware. When Bus is moving it will continuously trace the location using GPS module with the help of Satellite. GPS will send this information to the microcontroller, microcontroller will process the data and will forward to the Zigbee module with present location and time. This Zigbee (1) will transmit the data to the Zigbee, present in the Bus Stop. It will start receiving data when Zigbee (1) is in its range. Here we have used IR sensors for checking availability of seats in upcoming Bus.

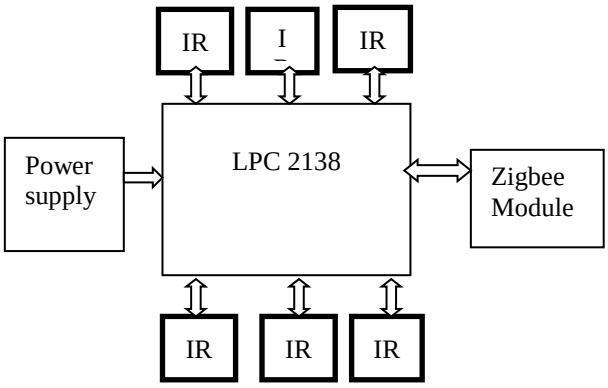


Fig.1 Block diagram for bus module

B) Block Diagram for Bus Stop:

The module installed at the bus stop has to perform dual communication tasks, one with Zigbee of the ticketing machine and another with GSM module located at central server. So, we need a microcontroller which has the capability to communicate with two devices at the same time without any conflict. So, we chose LPC 2138 for our development.

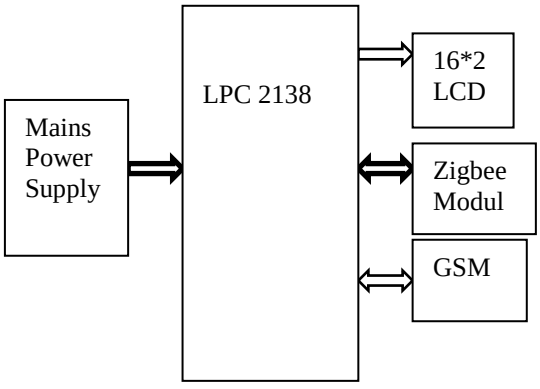


Fig. 2 Block diagram for Bus Stop

c) Block Diagram for Server:

Now in server side, microcontroller will receive information from the GSM present in the bus stop, now the server process over this information, and it will sent the present location and time of the bus to the next bus stop. (Like bus no 1 will arrive in 10 minutes). And to the previous Bus stop. (Like Bus no 1 left). Related Bus stops will collect data from severs, also displays the data on LCD present in the Bus stop.

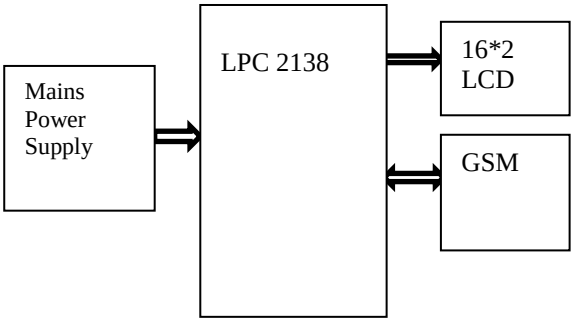


Fig. 3 Block diagram for Server

In this way server will receive information from all the bus stops present under that server. Data will be displayed on LCD present in that server.

III SYSTEM OPERATION

The algorithm is devised in such a way that the passengers become aware of bus arrival time and the probable occupancy in the bus, displayed at the stop.

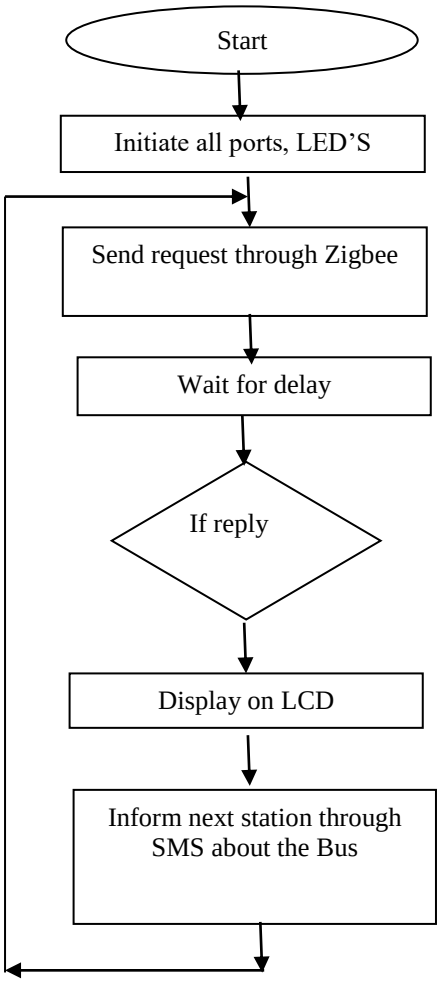


Fig. 5 Flow of system

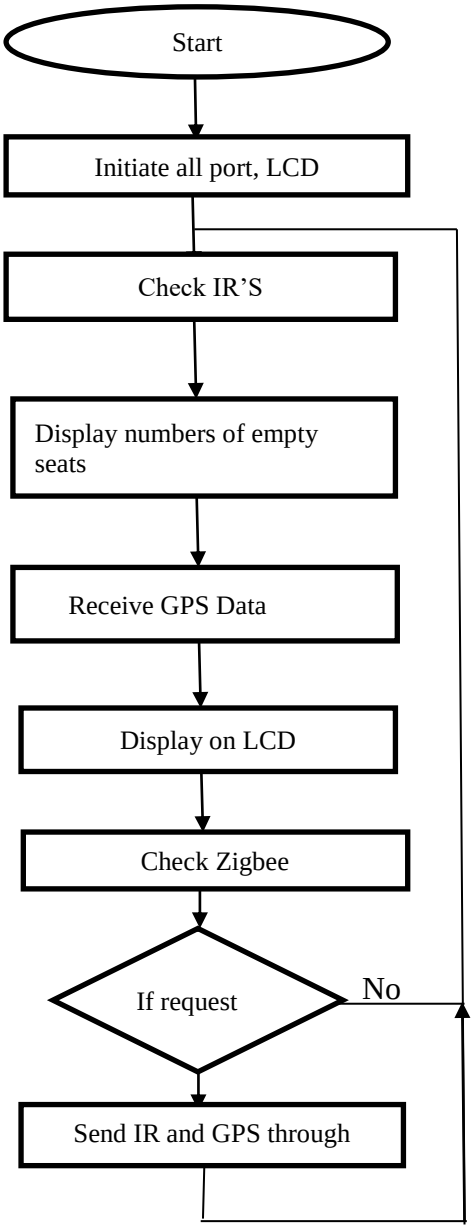


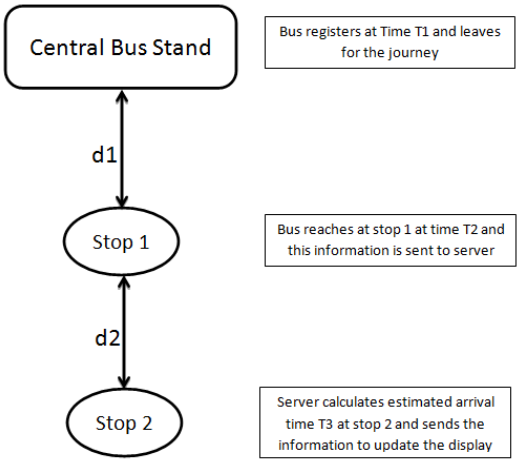
Fig 4. Flowchart of bus

Methodology:

1. Reporting of bus for a particular route will be done at bus stand (Central Server) and all the stops on that route will be informed about start of the journey from 1st stop. At that time, server will store the time at which reporting was done for further Calculations.
2. When bus reaches the stop on concerned route (e.g. Stop 1 on Route 1), bus send the information about the occupancy in the bus to the bus stop using Zigbee communication.
3. The Bus Stop will forward the same information to the central server along with a time (time of arrival).
4. The Central Server will analyse the information and calculate the arrival time and available vacancies at all next stops and send the Information to each stop in concerned route.
5. All the stops, after receiving the information from the Central server will update the display (LCD)

IV. RESULTS AND DISCUSSIONS

Estimation of Arrival Time: The central server estimates the arrival timing of a bus and informs it to all next stops carrying out the mathematical calculation.



Arrival Prediction:

$$T3 = T2 + \frac{D2}{speed(Bus\ Stand, Stop\ 1)} \quad \ldots \text{(Eq 1)}$$

$$Spee\ (Bus\ Stand, Stop\ 1) = \frac{D1}{T2-T1} \quad \ldots \text{(Eq 2)}$$

$T3$=*Distance between central Bus Stop and Stop* 1
$T2$=*Distance between Stop* 1 *and Stop* 2 $D2$=*Distance between Stop* 1 *and Stop* 2 $D1$=*Distance between central Bus Stop and Stop* 1
$T1$=*Registration Time of Bus at Central Bus Stand*

Vacancy Prediction:

$$Va\ (i) = Occ_{\max} - \sum_{j=i+1}^{n} \text{occ(j)} \quad \ldots \text{(Eq3)}$$

V. CONCLUSION

More reliable the public transport system more will be its usability. In this system architecture implemented for public transit system using LPC2148, GSM and Zigbee communication. For occupancy indication primitive features were made to ensure accurate vacancy information. Prediction of bus arrival time to the next bus stop is also displayed on the display. Central server plays the important role having Zigbee and GSM connectivity. Server updates the next bus stop in associate route. This system gives occupancy indication and also arrival time prediction to the passenger.

VI. FUTURE SCOPE

1. Use of Real-Time Operating System (RTOS) for better flow control of the program
2. Use of XBee Pro with for better collision avoidance.
3. Use of commercial messaging service instead of SIM service for cost effectiveness.
4. Once the system is implemented, a strong network of ZigBee and GSM can be utilized for many purposes; such as Pollution Monitoring e.g. Air and sound and to collect the data throughout the city.
5. Use Low power displays such as LED displays in order to enhance the display capabilities and reduce the power requirements.

REFERENCES

1] "Intelligent Transport Systems In India" by European Business and Technology Centre (EBTC), A Report – 2012

[2] Lelitha Vanajakshi and Asha Anand "Intelligent Transport Systems In India" – A Synthesis Report on ITS including issues and challenges in India , IIT Madras, Dec 2010

[3] Rijurekha Sen, Bhaskaran Raman - "Intelligent Transport Systems for Indian Cities" by, IIT Bombay, 2011

[4] "Delivering Intelligent Transport Systems" - Driving integration and innovation: A white paper of IBM Corporation, 2007

[5] Razi Iqbal, Kenichi Yukimatsu, Tatsuya Ichikawa by "The Flexible Bus Systems Using ZigBee as a Communication Medium"

[6] Jin Xu, Zhe Huang In: Innovations and Advanced Techniques in Systems, Computing Sciences and Software Engineering 2008, pp 520-525 "An Intelligent Model for Urban Demand responsive Transport System Control"