Automation of Public Transportation vehicle by ZigBee & RFID modules

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Abstract - *Intelligent transportation system is a crucial part of Indian's information structure. With the increasing city Holdings of cars, there are more and more traffic jams, so requirements are that intelligent transportation needs more improvement. The key technology of intelligent transportation is automation of public vehicle system, while the key of which is retrieval of information related with each vehicle and positioning System. The design of this project is vehicle positioning system based on arm a combination of ZigBee and RFID can upload the Information of the vehicle such as the number of vehicle and time to reach at several stations, arrival of vehicle to center in time, to make it convenient to control the Traffic of public transportation. What's more, users can use the password to track vehicles, for security and anti-robbery, call manual / automatic Alarm, and check the vehicle positions.*

Key Words: *Public Transport, Vehicle traffic, ZigBee, RFID.*

1. INTRODUCTION

In the last few years due to increase in the population, rise in standard of living of people, developing economy and rising level of vehicles public outlook have increased extremely. In the present situation of the public transport travelers do not have information to choose their bus for their respective destination. The travelers are uninformed with the routes that the particular bus will track. Travelers even don't know the time essential by the bus to reach the bus stop. Travelers face many problems in choosing the right and proper bus that will direct them to desired destination.

Wireless communication plays a very crucial role in the streams' of Army, Navy and Medication. In the previous some years the use of communicating from one point to other is done by Walkie Talkie. Then after the growth in the field of technology the various devices such as GSM Modem, Internet, Wimax etc. are deployed for the communication purposes.

This paper describes the efficiency and capability of ZigBee. Up till now the use of ZigBee was accepted only in the internal operation of vehicle or indoor applications. This paper gives the idea of making use of ZigBee and RFID as inter vehicle i.e. vehicle to station communication or vehicle to infrastructure communication. The ZigBee devices is used to communicate between the Bus module which fitted at entry point and the Bus station controller module the use of ZigBee will reduce the total cost of the system as ZigBee is low cost than other wireless communication devices. The power consumption of ZigBee is also less as compared with other wireless communication devices such as Bluetooth, Wi-Fi. By the ability of ZigBee to use low power it can be employed in hilly regions where power is major factor to be considered.

For a long time in urban areas there are a number of issues faced by the people due to traffic conditions. However, recently, the urban transportation system has been urbanized because of the appearance of the wireless technology. The public transportation system will send off and control the people about the public traffic vehicles automatically along with the time of vehicles via the electronic display boards thus reducing the travel time of passengers. The realization of the Efficient Public Transport system must be under the backing of innovative ideas and the support of refined techniques. The Public transportation system has a big position in the entire urban areas. The intelligent public transportation based on ZigBee and RFID will become an active area of research.

2. SYSTEM DEVELOPMENT

Automation of Public Transport System contains two modules.
1. Bus Entry Module/ Bus Exit module.
2. Bus station controller Module.

Both the modules have ZigBee interfaced to it as a need of transfer of information between Entry/Exit modules. Bus entry/ exit module also contains GSM module which use to send relevant bus data for further use. It contains information of Bus ID, arrival time of bus etc.

2.1 Bus Entry Module/ Bus Exit module

The most important part of efficient public transport system is a Bus Entry Module/ Bus Exit module.
Bus Entry Module/ Bus Exit module makes the use of microcontroller which is further interfaced with ZigBee module, RFID reader with serial interface for particular tasks. One of device that is interfaced with microcontroller is ZigBee which has been in employment to obtain the communication i.e. data exchange between Bus Entry

Module/ Bus Exit module and Bus station controller Module. Microcontroller used in the module is ATmega 128 which is interfaced with RFID reader. Bus module will also display the latest bus that is going to arrive at the Bus stop. The use of RFID reader is to validate the Bus arrived at the Bus stop. Different Buses are attached with different RFID Tag. As soon as the RFID Tag is in the range of the RFID Reader the respective Bus will be validated and the module will display the arrival of Bus and also the module will transmit the information, i.e. the arrival time of the respective bus to the next stop, departure time of respective Bus. The next bus stop will also be informed regarding to the latest bus that is to arrive next station.
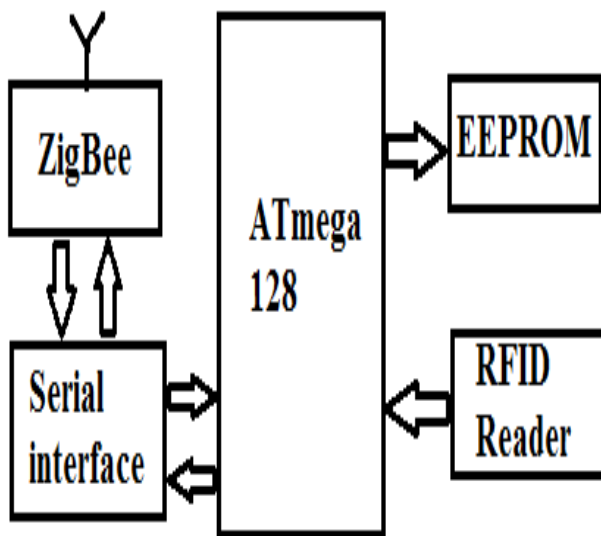

Fig -1: Bus Entry Module/ Bus Exit module

The Bus Entry Module/ Bus Exit module also contains EEPROM with it. The use of EEPROM to store the data concerning with the Bus ID, Bus Number and final station of Bus. The EEPROM is also used to store the reply that need to be transmitted for the arrival of the Bus.

2.2 Bus Station Controller Module

The second module that is present in the automation of public transport system is the Bus station controller module. Bus station controller module also makes the use of Microcontroller ATmega 128 which is responsible for manipulating all the devices that are interfaced to it. ZigBee transceiver is used to make the communication between Entry/Exit Module and Bus station controller module. ZigBee and microcontroller connected to each other using serial interface. Each Bus module has unique identification Id number which is given at the time of writing the information through RFID writer. These Id number is referred to the RFID tag. Reader validates tag and the unique tag number is stored in the EEPROM and respective Bus gets identified through tag ID.
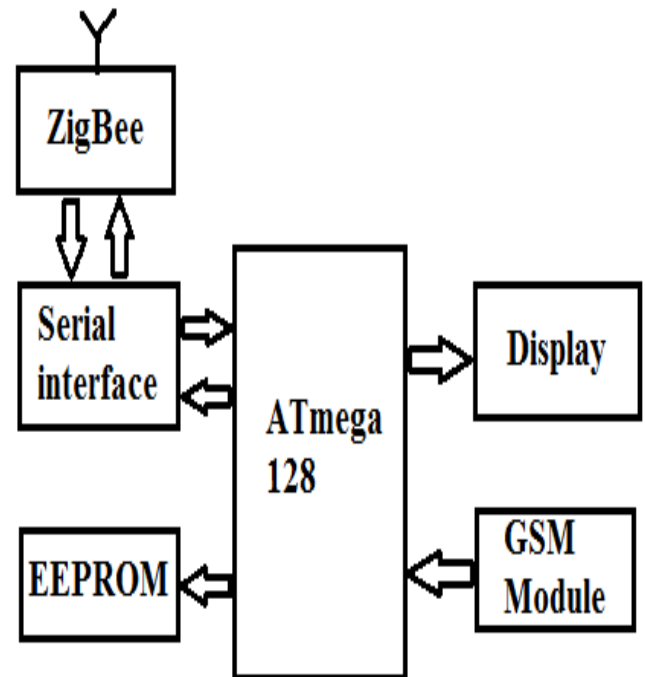

Fig -2: Bus station controller module

Microcontroller used in the module is interfaced with the LCD Display. Display used in the module is LCD 16X2 alphanumeric displays. It displays the current stop name the bus arrived at. Display is used to notify the passenger about the timing of arrival and departure of Bus. While arrival of bus it blinks information related to current bus.

Special functioning of this module is carried out by GSM module. At the time of departure, information related to bus, RFID tag ID is send through GSM module.

3. Operation of module

All this system based on combined work of RFID and ZigBee modules. There are three controllers used in wireless modules.

1. Bus will enter inside the station from Entry point. Every bus will have a unique RFID card. It will get detected by RFID reader module which interfaced with microcontroller. From this Entry module received data which contain information about bus will transmitted to Bus station controller module.

2. ZigBee module at Bus station controller will receive the information. According to received information GSM module will send Short Message (SMS) to previous station from which the bus left. So the previous station knows that the bus has arrived at next stop. Also name of the bus will be shown on LCD display.

3. Bus will exit from Exit point. Again RFID reader on Exit module will detect the RFID card and ZigBee module of exit module will send the information to

Bus station Controller module. ZigBee at bus station controller module receives data from exit module and sends Short Message (SMS) to the next bus station. This message contain information about bus ID, Departure time etc.
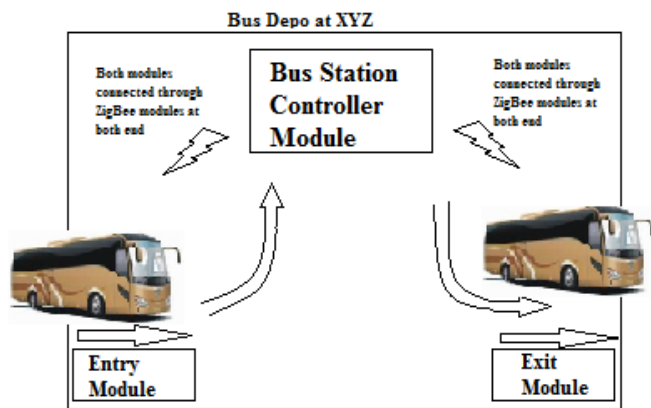
4. OVERVIEW OF AUTOMATION PUBLIC TRANSPORT SYSTEM

Fig -3: System overview

Above diagram gives overall idea of working of Automation of Public Transport System. Every Bus has a RFID Tag and each bus depot contains a Bus Station controller Module, Entry Module and Exit Module. RFID Tag is Unique Id which attached with Bus so whenever any bus reaches Entry and Exit Point, it get validated and get informed on current stop.
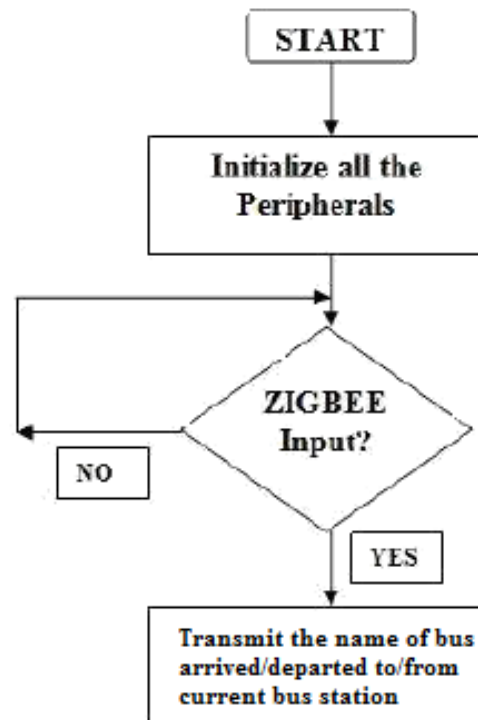

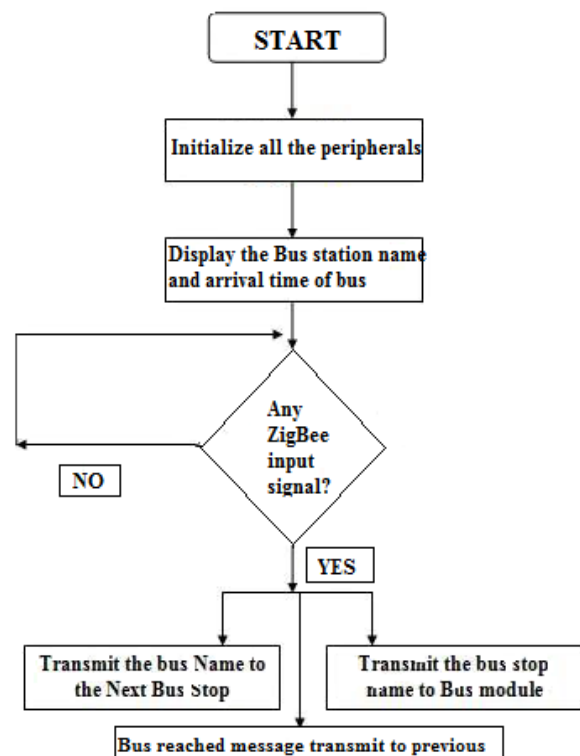**Fig -4**: Bus Station Controller Module flow diagram

Fig -5: Bus Station Controller Module flow diagram

4. FLOW DIAGRAM
5.

6. RESULT

Fig. 7 shows the output of the Bus station Controller module. Displays shows the module is waiting for the update. As soon as any update arrives after validation displays shows the name of the bus which has to be arrived or left.

Fig -7: Bus Station Controller Module overview

7. CONCLUSIONS

The Automation of Public Transport System is a reliable and cost effective system. By the use of ZigBee and RFID for the communication purpose the cost of the system reduces greatly. Power consumption also reduces due to ZigBee. Urban areas have a lot of necessity of this system as the traffic density is high in cities. This system is also able fulfill the demand of passenger by providing them the real time information of the bus which has to be arrive and also get timing information of arrival of bus. The system is cost effective. All these make the Public Transport System Rich and Reliable.

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