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GSM Based Bus location tracking and passenger density detection system

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Abstract. In this paper, tracking of buses and passenger density detection using GSM technology has been discussed. Ticketing machine in the bus will be fitted with an GSM and Bluetooth module. The Bluetooth module will receive the information from the Bluetooth module attached with the odometer in the bus which will send the distance travelled by the bus. This information, that is, the distance travelled by the bus will be transmitted to the server every 15 seconds. The bus ticketing machine will generate an 8 digit hex-code, which will contain the following information

- Bus route number
- Particular bus number
- Direction of travel
- Bus passenger density
- Bus stop number

This information will be transmitted to the server as soon as each bus stop is reached .Next two bus stops will also be intimated about the approaching bus. Thus LCD unit in the bus stops will display the information to commuters standing in the bus stops. By sending this information to Server, it can accurately track the location of the bus. This information can be sent to commuters through SMS service on-demand .This system is very much cheap ,easily implementable on large scale and very much suitable for countries like India .

Keywords: public transport information, GSM machine, SMS, server.

1. Introduction

Public transportation, mainly bus transport system has been the most used means of transportation in India. But it has been seen that commuters are most of the time kept waiting in the bus stand for long time .With millions of people using this public bus transport system, would it not be nice and worthy to provide real time update of bus location and approximate time to reach the destination? .That is that, we hope to achieve with this project. This system does not use GPS. Instead, in this system a GSM Machine is used to transmit a 32-bit binary code, which is received by the receiver (generally a computer) which encodes it. The encoded data is loaded in the Server. Then the information is sent to the user on-demand.

2. Overview

This system consists of two stages of data transfer. The first stage of data transfer involves transmitting the data from the bus to the server using the ticket vending machine controlled by the bus conductor .The second stage is the transfer of the data from the server to the mobile number of the person who has requested the data .

2.1. Data transfer from bus to server

The first stage of data transfer involves transfer of data from bus to the computer connected to the

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Server. The bus is fitted with a GSM Machine which is controlled by the data fed by the controller .It is necessary to keep the information short (because we are using SMS service to transmit the information) and easy to decode for which we have decided to use hex code. The data to be transmitted is a 32-bit code of which first 12 bits stand for the particular bus route, i.e. for example 11H, 49A etc . Each route may be assigned a particular code. The next 8 bits represents the particular bus in a particular bus route. This is to distinguish between various buses having same bus routes, which means it can have store 255 values. These 20 bits, explained till now, are constant for a particular bus. These values cannot be altered by the controller (bus conductor). The next bit is used to check whether the bus is moving from source to destination or in other way. The next 3 bits is used for obtaining the people density in the bus. This value is obtained from the controller (bus conductor). This can have 5 different values, where

- 000 stands for 'free seats available'
- 001 stands for 'no free seats available'
- 010 stands for 'some people are standing'
- 011 represents 'more people are standing'
- 100 represents 'bus is full'

The controller will have an option to select from one of the 5 options available. These values are not fixed and vary for different types of buses. Based on the maximum standing capacity of the bus , the conductor will make a choice.

The last 8 bits stands for bus stop number. The value gets incremented as soon as the stop is reached. This value along with the manually fed people density value and other data, is collectively transmitted to the computer connected to server via SMS system .This information can also be uploaded in website , and updated regularly so that website can provide accurate data to internet users as well. This information will also be sent to the corresponding two bus stops which will display the buses approaching it.

2.2. Block diagram

This block diagram show the 32 bit encoded data:

- 12 bit data represents the bus route Number
- 8 bit data represents bus number
- 1-bit data represents direction of travel
- 6-bit data represents bus density code
- 8-bit data represents bus stop number

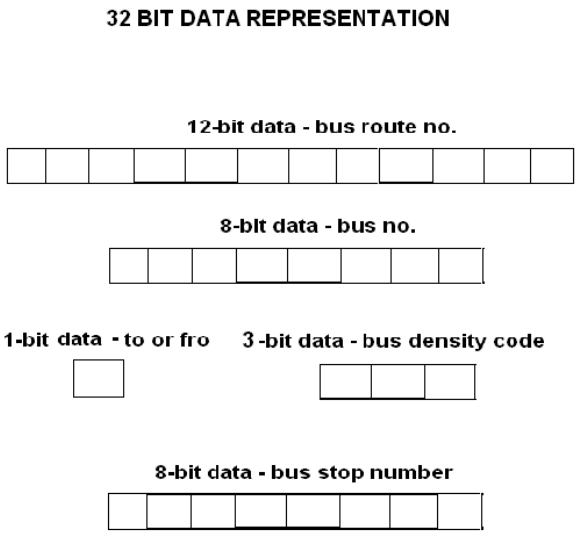

Fig.1: 32 bit binary data representation

2.3. Estimation of the distance travelled by the bus

The distance travelled by the bus can be found using the odometer. The digital output of the odometer will be sent using a Bluetooth module. The ticket vending machine will be fitted with a Bluetooth module to receive the data. This data will be sent to the server at distinct and short intervals of time so that mapping of bus will be easier. By doing so, we can easily say whether a bus is held up in traffic or we can also determine the average speed of the bus.

2.4. Block diagram of first stage of data transfer

Here in first stage, the GSM machine fitted in the ticketing machine will transmit information .

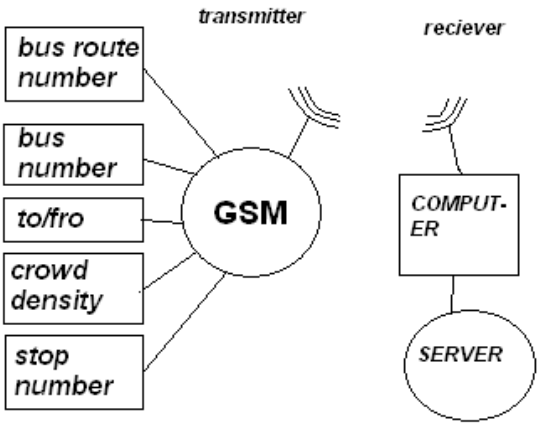

Fig. 2: first stage of data transfer.

2.5. The block diagram of second stage is shown below

(i) User requests for an information by sending a SMS to a particular service number. The Server reacts immediately by providing the required information.

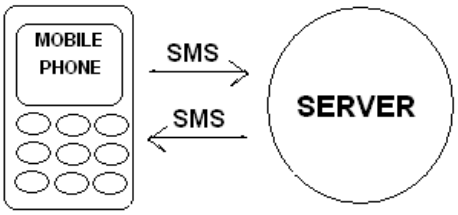

Fig. 3:On-demand information from server to the user

(ii) The server uploads the data obtained from the computer to the internet for accessing information online .This information will be updated regularly, so that user can receive accurate information.

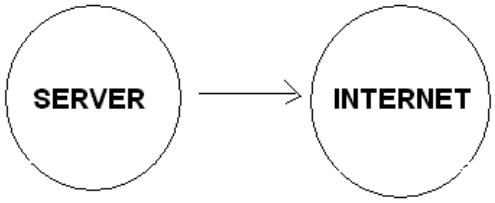

Fig. 4:transferring the instruction from server to internet from accesing information online.

2.6. Advantages

There are several advantages of using this system. A few of them are listed below:

- This system is very cheap and easy to implement in a large scale.
- This system provides accurate information to the passenger.
- The system data can be analyzed for a period to provide information which can be useful to both commuters as well as transport department. The pattern observed can be used to take important decisions like inducting new bus routes, by observing the passenger density at different location and at different periods of time .The data obtained from these can be used by transport department for deviation of traffic, alter the routes, thus making way for less-traffic roads.
- This system can make passengers waste less time in the bus stops.
- The people density System which can help user decide to board a bus or not based on its density from the response SMS received from the server, which is an unique feature.
- The Bus Stops could be updated with list of approaching buses, with approximate timings, received from server, which could be of use to commuters without mobile phone connections.

2.7. Conclusion

In this paper, we have explained about an economical way of providing information to the commuters, as well as using the data for analyzing the traffic patterns, thus altering the bus routes for increasing efficiency of bus by decreasing the travel time, as well as inducting new bus routes as per the demand, just by using 2G mobile services .This system can be further improvised by using 3G technology, which boasts of better data transfer rates. This system can be further enhanced, so that various public transport information can give rise to developing an integrated transport information, where in two or more public transports information can be linked together, thereby providing enhanced and more accurate information to the commuters.

3. Acknowledgements

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