



GPS and GSM Based Database Systems for User Access

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Abstract: Nowadays commuter is one of the basic needs for the people. For long distance travel people use government transportations. The government has provided many facilities to the people like advance ticket booking, departure and arrival timings of commuters etc. But still people are waiting to catch for them in the stations due to uncertainty of the commuter's timings. This paper addresses an efficient solution for tracking of the commuters' and delivers useful information of particular commuter to the passengers. This system consists of database which continuously updates the details of all commuters. The passenger can query a message to database system for the commuter location using its number through mobile. The database system automatically replies to the passenger with details of the commuter. So the passenger need not wait for commuter and need not to worry the timings. This paper mainly addresses the tracking of trains. Later the same can be implemented for other commuter. It is implemented using ARM processor LPC2129 module, GPS634R and GSM SIM300 modules.

Keywords: ARM processor, ZigBee, GPS, GSM.

I. INTRODUCTION

In recent days GPS system is included in almost all of the transportation systems like bus, trains airport cabs etc for the safety, monitoring, speed controlling and to inform the police if any accident occurred. The GPS device will monitor the speed, distance covered by the vehicles. So the driver can easily find out how much distance he has covered and in what speed he is travelling [1]. We can track the vehicles by using web applications and the GPS device. To develop this application we need internet facilities in the vehicles. It's difficult to get network in all the area and also it is very expensive [2]. The other concept which is much useful for the vehicles is an Anti-theft Tracking System. Here it is mainly concentrated on the personal vehicles. A GPS and GSM based electronic kit is kept in the vehicles. If any person tries to unlock the vehicle by using duplicate key, the warning message will be send to the owner. If the thief broke the locker of vehicle, then GPS system will get trigger by sensor and send message to the owner with present latitude and longitudes [3]. By using cloud computing also it is possible to track the vehicle information. In this the user need to get license from the companies which are maintaining the cloud computing servers and also user has to develop a web application to track the vehicle[4]. But these are specific applications and applicable only for specific persons. Here it is presenting the general application which helps to the public. This paper mainly concentrates on the transportation sector. The GPS and GSM based electronic system has kept in buses or trains. The people or passenger will get the information about the trains or buses. So the passengers no need to wait for the buses or trains.

This paper describes the "GPS and GSM based database system for user access". Passengers can track the train locations with respect to its stations and no need to wait for the trains. Passengers can get the information by sending a single SMS to the server or Base station.

II. SYSTEM FUNCTIONS AND COMPSITION

This section describes brief theory of the modules used in the system.

A. **Embedded system installed in trains**

It consists of ARM Processor, GPS, GSM modem, LCD display.

B. **ARM Processor**

This is the heart of the intra vehicular module placed in all trains. This processor is connected with all peripherals such as GSM, GPS and LCD display. Initially it receives the data from GPS for further processing.

C. **GPS**

It is used to get the latitude and longitude of trains. The processor gets these latitude and longitude and checks with the stations. The GPS data updates continuously and sent to the processor.

D. **GSM modem**

It will send the message to the database system, only if train is in the stations. This is controlled by ARM processor.

E. LCD display

It is interfaced with ARM processor. Mainly it is used to display the information.

III. DESIGN AND IMPLEMENTATION OF MODULES

This section describes the implementation of all modules used in the designed system.

A. Design of Embedded module

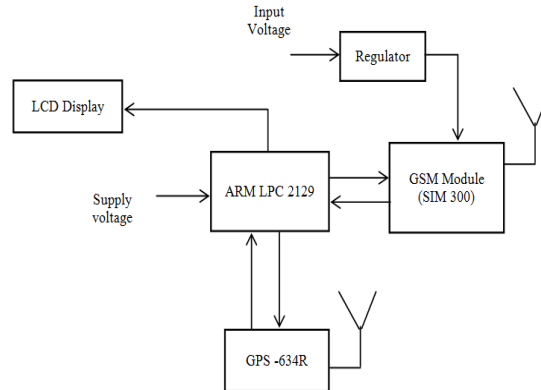


Fig.1. Block diagram of Embedded module installed in Trains

Figure 1 represents the block diagram of embedded module installed in Trains. Here LPC2129 ARM7 processor is used. A 16*2 LCD display has interfaced to the processor. The GPS device is interfaced to the processor. There are two UARTS in the ARM7 processor. The GSM modem is connected to processor through UART1 in the processor.

Initially the complete device is installed in the train. The main aim of this device is to send locations to the base station. To achieve this, all latitudes and longitudes are saved into the memory along with the location names. Whenever the processor will be on, it starts to compare with present latitude and longitude with stored latitudes and longitudes. The present latitude and longitude will get from the device. If it matches to the stored latitudes and longitudes, it fetches location name which is already stored in the memory. The processor sends the train unique ID and location name to the base station.

The processor again starts to compare with the stored latitudes and longitudes. When the train crosses present location, again it sends same location name to the base station.

B. Base Station Module

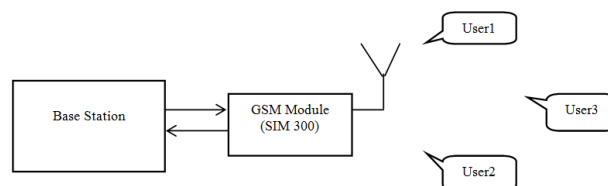


Fig.2. Block diagram of Base Station Module

Figure 2 represents the block diagram of Base Station. The base station is having a database which has designed according to the requirements. The database is designed with MS Access. This is installed in the computer. The computer is connected with GSM Modem.

The software application has developed for storing the incoming data from the trains and replying to the passengers from base station. This application has developed by using Visual Basic 6.0. This application provides options to admin, to start serial communication with GSM Modem, to stop the Serial communication. This application also replies to the messages automatically. Initially when user clicks on "START" button, the application checks whether GSM modem is connected to the computer or not. If it didn't connect to computer then application gives you an error message. After connecting GSM modem to the database or computer, it shows port number where the port has connected. Admin has to select port and click on the START button.

The application fetches the port number from UI and connected to the specified port number. The application will connect to the GSM modem by using the AT commands. The application again goes to the READ mode and waits for the incoming messages. When the application gets the message from the GSM modem, first it will check whether it is from passenger side or vehicle side. If the message is from the vehicle side then it will read the message and add or update the data to the database according to the unique ID of the vehicles. If the message is from passenger side then the application will read the message and reply to the passenger according his requirements.

The message has to be sent in a format by the passenger is: - *121, 12536.

Where “12536” is unique ID of the train. The application will reply to the passenger with Status, location and timings of the vehicle.

IV. HARDWARE AND SOFTWARE DESIGN FLOW

A. Embedded module Design Flow

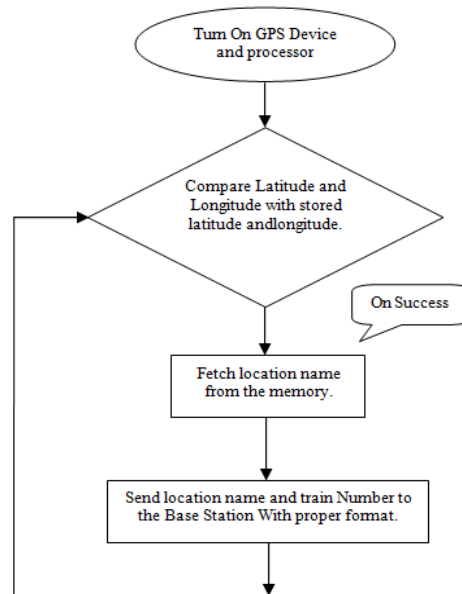


Fig.3. Embedded Module Design Flow

Figure 3 represents design flow of embedded module. The GPS device turned ON initially and gets the latitude and longitude of the present location. This is received by the processor. The processor compares this data with stored data. If it is equal then the processor gets the location name from its memory. That location name is written in GSM modem via UART communication. Next processor gives send command to the GSM modem along with location name, train number and server number. Again server waits for the latitude and longitude of the GPS device.

B. Base Station Design Flow

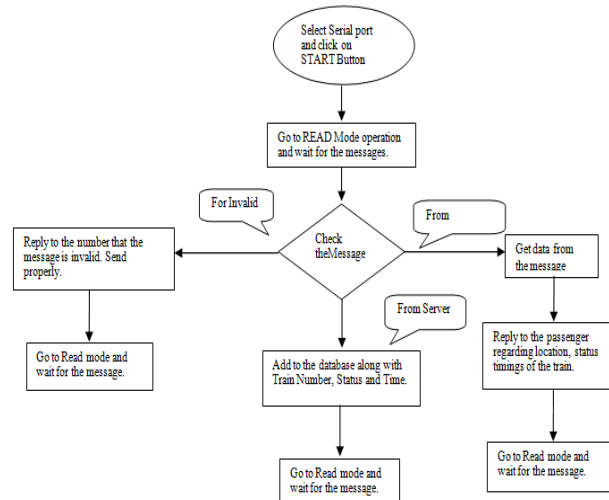


Fig.4 Base Station Design Flow

Figure 4 represents design flow of Base station. Initially admin selects the serial port in the user interface. Once admin clicks on start button, the software checks whether GSM modem has connected to selected port or not. If not, then it gives an error message. The software enters into READ mode operation and waits for the messages. When any message is received by the GSM modem, processor checks its format. If format is not proper then it replies as invalid message. If the message is valid then it checks whether message is received by the train or passenger. The processor identifies with unique identification between train and passenger. If the message is from train then server updates the details according to train number. If message is from passenger then it replies the train details to passenger. Again the software goes to READ mode and waits for the messages.

V. RESULTS

A. Results of embedded device

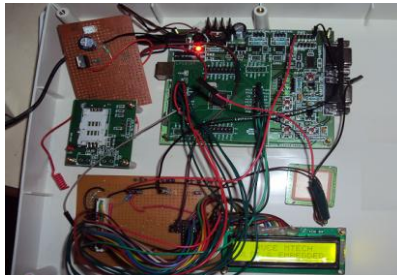


Fig.5 Embedded Device installed in trains

Figure 5 represents design of embedded device installed in the trains. It consists of processor along with GPS and GSM modules. Both are connected to two different UARTS. First UART communicates with GPS device. Second UART communicates with GSM modem. The program has dumped or flashed into the processor. The processor operates according to the code.

B. Results of Base Station

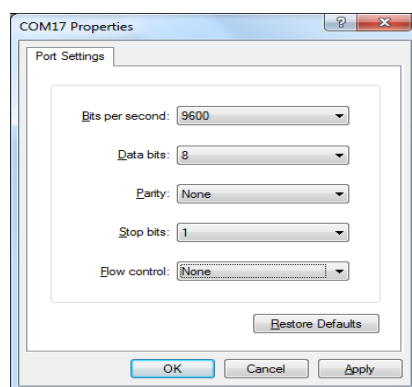


Fig.6 Hyper Terminal Operation

Figure 6 represents hyper terminal operation. This software is used to test the GSM modem which is connected to server. This software operates in UART mode, where admin can easily check whether the GSM modem is working properly or not. Once it is working properly, admin can take further actions.



Fig.7 Base Station User Interface

Figure 7 represents base station user interface. The admin selects port number and clicks on START button to start the server. Once the server has started, it waits for the incoming messages.

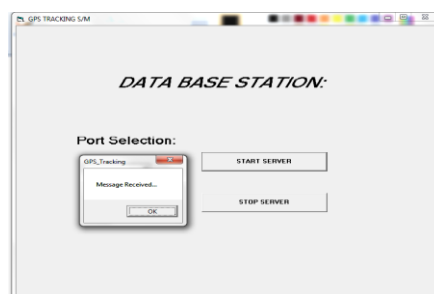


Fig.8 Message Received

Figure 8 represents message received by the server. Here the message may be sent by trains or passengers. The server detects message automatically from whom it has sent. It will do the further operations according to the message format.



Fig.9 Message Updating

Figure 9 represents message updating in the database. This indicates that if the message is received by trains, then server updates its information.

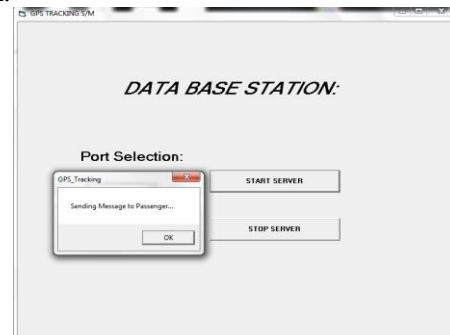


Fig.10 Message Sending

Figure 10 represents message sending to the passenger. If the message is received by passenger, the server searches train details in the database and replies the updated details of that train to passenger.

VI. CONCLUSION

By using this application, commuter system can capture the locations and updated information of the locations. It will be more helpful to the passenger; they can get the updated status of the vehicle by sending sms. So that, passenger need not wait for the trains in the stations. Here the paper has implemented without using web applications in it. The cost will be more if in case of web application is used. Separate server has to maintain for this web applications. The passenger has to use smart phones or high end mobiles with internet facilities. It's very less cost, easy to maintain, paper can further implement this application to get more reliability and flexibility to the passengers.

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