

# Vehicle Tracking System using Smartphone with GPS/GSM/GPRS Technology

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**Abstract-***The smart bus tracking system is designed and implemented for tracking the location of the bus at any time. The proposed system is popular technology that combines a smart phone with microcontroller. The making of this technology is easy and inexpensive compared with other. This is the stand alone system used to locate the real time locations of the buses. The design consists of Global Positioning System (GPS) and Global system for mobile communication (GSM) is one of the methods for vehicle tracking. The design is fixed inside the bus to track in real time. The GPS and GSM module is controlled by a microcontroller. The geographic information is getting by the tracking system by the use of GPS modules. The information is transmitting through the database by GSM module. And develop the smart phone application to get bus information and timestamp details.*

**Keywords-**vehicle tracking, microcontroller, smart phone application, GPS/GSM technology.

## I. INTRODUCTION

The shipping industry was first implement the vehicle tracking system to know the people the vehicle location any at given time. As the technology growing vehicle tracking system is used to track and display the vehicle location in real-time. The proposed system consists of GPS/GSM/GPRS technology and a smart phone application to provide the service to the users. Smart phone users are increase with the overall population compare with the basic mobile users. The smart phone is more familiar to the people for the day to day uses. It consists of large verity of applications to overcome the needs of the user. Our project we develop the bus tracking device with smart phone application. These two parts are work simultaneously to track the exact location of the bus in real-time and convey it to the user. The GPS/GSM technology is the common way to design the vehicle tracking system. The vehicle location is the main thing for the vehicle tracking system. The GPS technology provides the vehicle location and timestamp detail anywhere on the earth. GSM technology is commonly used in wireless data transmission. The SMS technology through the GSM network and the GSM modem provide the vehicle location to the user. By the use of SMS technology the proposed system use the android application to track the bus information from the vehicle tracking system.

This tracking system is controlled by the microcontroller. The electronic device present in the tracking device in most to track the location of the bus.

## II. IMPLEMENTATION DETAILS

The hardware and software design techniques are needed in the development of the vehicle tracking system controlled by the microcontroller.

### A. PIC Microcontroller

The PIC16F877 is used as the brain to the control the smart bus tracking system. Pic shields are used for GPS and the GSM modules. The software program written in c programme language to control the modules and saved in to the flash memory of the microcontroller.

### B. GPS module

In smart bus tracking system the Global Positioning System is used to provide information to the user such as location, time stamp, speed, and so on. The GPS module consists of GPS receiver with antenna. Once the GPS and the microcontroller are assembled the vehicle location are get automatically by the GPS module. To access the GPS module data information the tiny GPS library is used.

### C. GSM module

The GPS module is used to establishing connection between a smart bus tracking device and a remote server for transmitting the vehicle location using TCP/IP connection to the GSM network.

### Hardware

The module consists of cellular shield and it is interface with the microcontroller SM 5100B cellular module. The GSM/GPRS shield with SM5100B is compact quad-based cellular module. The antenna and the SIM card more reliable to working with the GSM/GPRS module. The proposed smart bus tracking system is need these kind of hardware for implementation.

**AT command**

AT command is used to communicate the modem with other device. TCP/IP is controlled by AT command SM 500B. The AT command syntax is follow.

```
AT<command...><CR>
```

AT is the starting word of the every command followed by the one or more command followed by the one or more command and terminated by the carriage return (CR). To connect the GPRS the microcontroller send the command follows on.

```
AT+CGATT = 1
```

The next step is set the packet data protocol it consist of access point name (APN). If the access point name is incorrect the sim is not allowed to connect the network. The APN is needed to access the data when the mobile and the GPRS is communicate with each other. The command as shown.

```
AT+CGDCONT = 1,\'IP\',\'APN\'
```

The network service provider is provide the user name and password to verify the network connection. The user name and password is given through the command is given below.

```
AT+CGPCO=0,\' user name \',\' password \', 1
```

**D. HTTP communication**

TCP/IP connection is established by the HTTP communication. The socket connection is needs to send data over the internet. The socket is useful for working with our server and it is used to user to establish a TCP connection for sending data. The socket has three main entities, a protocol, IP address, port number. The command looks as follow

```
AT+SDATACONF=1,\'TCP \',\'server address\', 80
```

The first parameter indicate the type of the protocol(TCP\UDP), second parameter is determine the host name and the IP address of the web server and the last parameter is determine the port number. When the connection is established the microcontroller is send the location information to the server.

**E. Web server and database**

The web server and database is used to store the information from the module. Web server is constructed by the free web hosting service. After a web server is constructed the data are manipulated in the database table. The web page

was constructed by PHP coding. The PHP function is executed and the bus location information is entered in to the designated table.

**F. Google maps API**

The smart phone application is used the Google map API to show the bus location information in real time to the user using an HTTP request. Google map server is accessed by the Google map API and responds to the user. The Google map API is used the two legs array contains the information about the two location information link.

**III. METHODOLOGY**

The smart bus tracking device acquires the vehicle ID and geographic coordinate in real time using GPS module. These are controlled by the microcontroller connected to it. And using GSM module the smart bus location information and ID is transmitting to the web server. The bus information is stored and manages by the database. The smart phone application is access the database and monitors the bus location on the Google map in real time.

**IV. DESIGN OVERVIEW**

The functional block diagram illustrate the how the component interact with each other and execute the desire operation.

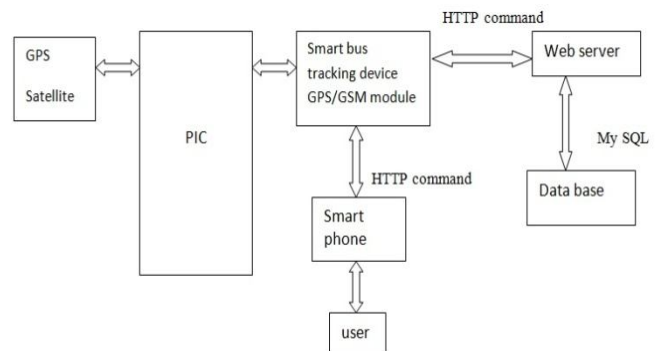


Fig.1 Block diagram of proposed system

**Smart Bus Tracking Device**

The GPS module receives the geographic coordinates from the satellite. The microcontroller read the bus location information through the GPS module. The GSM/GPRS network transmit the bus location information an ID to the web server. For the TCP/IP communication the GPS/GPRS module is used.

**Smart Phone Application**

In order to develop the vehicle tracking system the smart phone was configured with the developed android application. The smart bus tracking system updates the smart bus tracking system. Also the distance and time information are displayed by the android application. The bus location is updated regularly when the vehicle location is changes.

## V. SOFTWARE DESCRIPTION

In our paper we use software tools such as MPLAB IDE v8.56 and ISIS7 professional for the simulation result. The software is designed and developed to execute the all necessary instruction as to get the desired bus location information. The MPLAB is used to develop the application for the microcontrollers and digital signal processing. The circuit is designed in the ISIS7 professional and the source file is get from the MPLAB to generate the simulation result.

## VI. EXPERIMENTAL RESULT

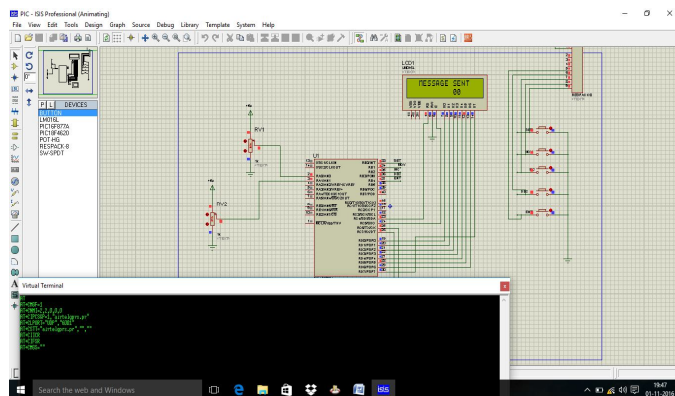


Fig.2 Result for initializing GPRS

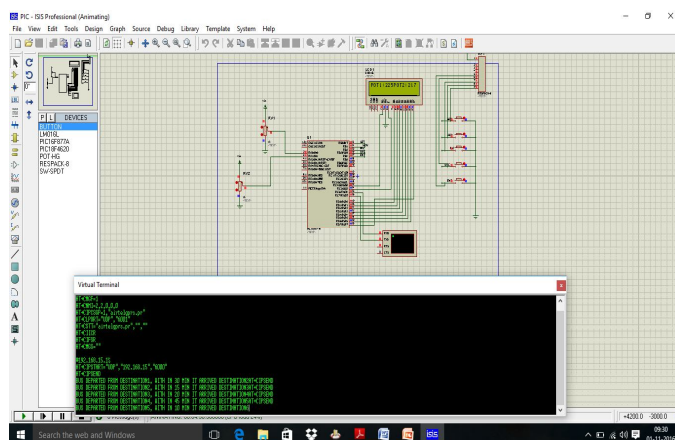


Fig.3 Result for getting location information

## VII. CONCLUSION

This paper describes the design and implementation of our smart bus tracking system. A smart phone application and server are used to track the location of the bus. The smart

bus tracking device is consist of a microcontroller and GPS/GSM/GPRS module to acquire the bus location information these information are transmit to the server by the GSM/GPRS network. The web interface created by PHP connected to the database. The vehicle unique ID is obtained from the database and the information is transmitting to the user by the smart phone application. It is easily access by the self electronic module.

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