

# GPS/GSM Based Bus Tracking System (BTS)

Christeena Joseph ,A.D.Ayyappan , A.R.Aswini, B.Dhivya Bharathy

Abstract- Vehicle tracking systems are available vastly in market, but a good and effective product tends to be of more cost. This paper is proposed to design and develop a tracking system that is much cost effective than the systems available in the market. The tracking system here helps to know the location of the college bus through mobile phone when a SMS (Short Message Service) is sent to a specific number thus noticing the bus location via SMS. By incorporating a GPS(Global Positioning System) and GSM(Global System for Mobile communication) modem the location of the device by sending a SMS to the number specified. No external server or internet connection is used in knowing the location at user end which in return reduces the cost

Keywords: Global positioning system (GPS), Global System for Mobile communication(GSM), Short Message Service(SMS), Look Up Table(LUT), location detail

## 1. Introduction

Tracking and monitoring of vehicles are increasing in urban areas as many commercial and private vehicles are available large in numbers. Many organisations and individuals find a need for tracking nowadays for safety. Logistics companies need to track vehicles when precious cargos are carried. Individuals track and monitor their vehicles as a concern for safety. Public transport vehicles are tracked nowadays to provide citizens with transportation details. But in all tracking systems internet and external data servers are used as a basic requirement. This involves investing a large amount of money into the system. So the system developed in this paper is mainly aimed at reducing costs in tracking systems and it is to be implemented in college buses which take a specific route on a daily basis. Also this can be implemented to public transport vehicles. The main aim is to find out the location of the college bus using GPS (Global Positioning System) and GSM (Global System for Mobile communication) by a message request from the user's mobile phone and without using internet at the user's end. Using GPS and with GSM the user can know the location of the bus by sending an SMS (Short Message Service).

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A database containing various location details is stored in the memory of microcontroller. This database is used in locating the bus. The tracking device consists of the GPS, GSM modem and the microcontroller. Location name and GPS coordinate values are stored as a LUT (Look Up Table) in the microcontroller. As soon as the GSM modem receives SMS request for location, the microcontroller checks for a closest location match inside the LUT with the received GPS coordinate data. The matched location detail is sent to the user as an SMS using GSM modem thus completing the request. Further service enhancements like breakdown alert can be made into the proposed system in a cost effective manner.

The paper is divided into the following sections. Section 1 introduces the model and concept of the GPS/GSM based bus tracking system (BTS). Section 2 provides the problem with the existing and how the proposed system tackles the barriers of existing system. Section 3 provides the literature review of some of the existing systems of GPS/GSM vehicle tracking system. And also the methods and technologies used in these systems. Section 4 describes the methodology and the design adopted for the system to make it efficient in various aspects. Section 5 provides the testing information and the implementation of the system. Section 6 gives the conclusion.

## 2. Problem Definition

Vehicle tracking has become so advanced and simple with various upcoming technologies. But the cost effectiveness and its implementation have become high. The problem lies in maintaining high grade servers to backup the data for vehicle tracking and the use of internet to track these vehicles. Although real time tracking of vehicles through internet gives an

overall advantage in vehicle tracking, the system fails to provide less cost of investment and maintenance. The system uses an internal database to look up the location of the vehicle with the GPS co ordinates received. So it doesn't use the GPRS and TCP/IP protocol for internet for data transfer between servers and the user device. Hence this reduces the cost of the tracking system. Also the location details are sent quickly through SMS via the GSM modem. Fig. 1 shows the Existing system Vs. Proposed system

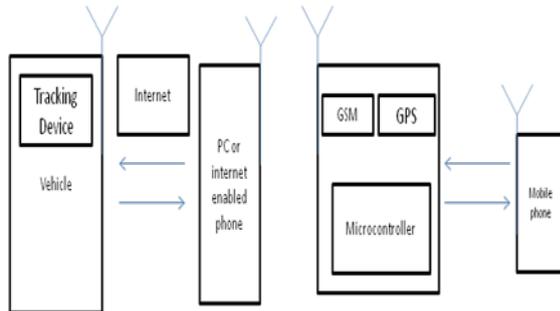


Fig 1 .Existing system (VS) Proposed system

### 3. Literature Review

There are many vehicle tracking systems being developed in the developed and developing countries. These embedded systems with their array of hardware modules have been included into lots of public and private vehicles in the urban area. A system for tracking and knowing the location of inter-city buses in urban areas was developed in Ghana by the University of Ghana. GPS and GSM/GPRS system was used in the tracking system which sends SMS alerts about the vehicle location and also provides real time tracking through web application. To maintain the tracking data external database server was used which again increased the cost of the tracking system. The system also provided many other enhancements like theft alert etc.[2] Tracking systems were first developed for the shipping industry to track cargo. First devices developed were passive. To obtain automatic and real time tracking active devices are to be used. Muruganandham and P.R.Mukesh proposed a system that uses GSM/GPRS modem and GPS system to provided real time tracking over the internet by TCP/IP connection through Java applications developed specifically for it. External databases are used to maintain the tracking details.[3] The Bangalore vehicle tracking and control systems at Bangalore and ongoing projects at Koyambedu, Chennai provides real time

solutions to public vehicles. [4]Based on the literature reviews, the system proposed here is a GPS/GSM real time vehicle tracking system with internal database of the various location details of which the vehicle would travel on a daily basis. This solution can be applied to public transport buses and college buses which take only the specified routes on a daily basis.

### 4.1 Proposed System Design And Methodology

The tracking device consists of the GPS, GSM modem and the microcontroller. Location name and GPS coordinate values are stored as a LUT (Look Up Table) in the microcontroller. As soon as the GSM modem receives SMS request for location, the microcontroller checks for a closest location match inside the LUT with the received GPS coordinate data. The matched location detail is sent to the user as an SMS using GSM modem thus completing the request. Further service enhancements like breakdown alert can be made into the proposed system in a cost effective manner.

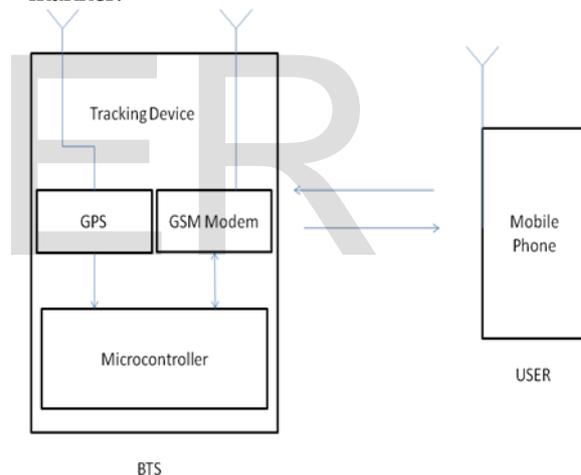


Fig 2. System Architecture

### 4.2 System specifications

1. Microcontroller: PIC16F77A microcontroller was selected. It has Operating Frequency of DC - 20 MHz, Flash Program Memory (14-bit words) of 8k, EEPROM Data Memory (bytes) 256..
2. The GSM module: Wavecom GSM MODEM WMO1-G900. It's a dual band GSM with asynchronous data transfer and SIM interface.
3. GPS module: Ubisentech's GPS receiver with an operating frequency of 5.45 MHz and on a voltage of 5v.
4. LCD screen: A 16x2 on board LCD screen for location display.
5. Programming: Programming in C using MPLAB IDE for the PIC and hi tech compiler to compile the program on board the microcontroller.

## 5. System Implementation And Testing

C program for tracking GPS co-ordinates and the testing.

```

voidgps()
{
  unsigned char dat;
  unsignedintgps_count=0,i,j;

  while( (dat=_getke())!='R');
  while( (dat=_getke())!='M');
  while( (dat=_getke())!='C');

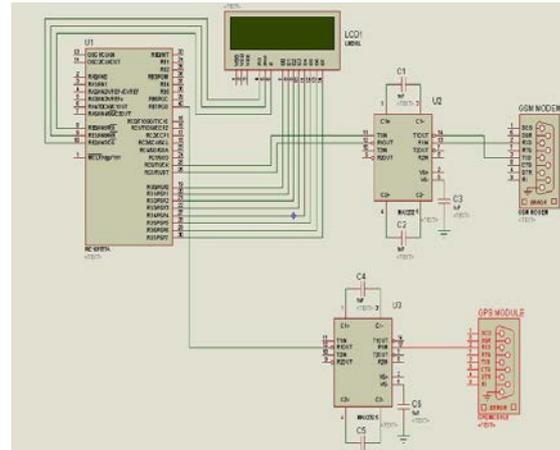
  do{
    dat = _getke();
    Latitude[i]=dat;
    i++;
  }while(i!=11);
  Latitude[i]='\0';
  dat = _getke();
  dat = 0;
  i=0;

  do
  {
    dat = _getke();
    Longitude[i]=dat;
    i++;
  }while(i!=12);
  Longitude[i]='\0';

  void decode_command()
  {
    unsigned char i=0,j=0;
    char * pch;
    char *data;
    pch = strstr (SMS_CONTENT,"+91");
    while(*pch!=0x22)
    {
      no[i]=*pch;
      i++;
      pch++;
    }//phone number
    // data=strstr(SMS_CONTENT,"COST");
    // while(*data!=0x0d)
    // {
    //   // mes[j]=*data;
    //   // j++;
    //   // data++;
    // }
  }
}

```

The above is a sample of the program showing the receiving of the GPS coordinates and sending of the SMS while message is received. Schematic diagram below shows the circuitry of the proposed system device.

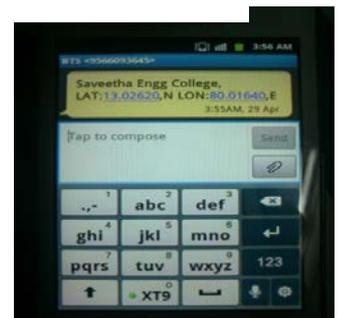


The system was implemented and tested. When the request SMS was sent the device responded by sending a response SMS to the user with the location details.

The request SMS triggers the Microcontroller to check the real time received GPS co-ordinates with the LUT and corresponding matched location detail is sent as SMS back to the user by the Microcontroller through the GSM module.

## 6. Conclusion

The proposed system operated efficiently and was cost effective. It is beneficial to vehicles that follow a specific travelling route on a daily basis. Also further enhancements like breakdown alert and over speeding alert can be made in to the system



## 7. References

[1] PIC projects

<http://www.picprojects.info/content/projects/9-vehicle-tracking-system-using-gps-gsm.html>

[2] Fleischer, Paul Benjamin; Nelson, Atso Yao; Bremag, Appah. Design and development of GPS/GSM Based vehicle tracking and alert system for commercial inter-city buses.

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