Advanced Vehicle Tracking System on Google Earth Using GPS and GSM

Sowjanya Kotte
Assistant Professor
Department of E.C.E
Sir C.R.Reddy College of Engineering.

Hima Bindhu Yanamadala
M.Tech Communication Systems
Department of E.C.E
Sir C.R.Reddy College of Engineering

***Abstract*— Vehicle navigation is one of the most important applications in the era of navigation which is mostly used by drivers. Therefore the efficiency of the maps given to the drivers has a great importance in the navigation system. In this paper we proposed a very efficient system which uses the GPS and earth maps to help the driver in navigation by robust display of the current position of the vehicle on a displayed map. The main aim of this project is designing a system which is capable of continuous monitoring of path of the vehicle on PC with Google Earth Application. Here the important issue is displaying the map on several various scales which are adopted by the users. The heart elements in the implementation of this project are GPS, GSM and MCU. The GPS-GSM integrated structure is designed to track the vehicles by using Google earth application. The micro controller is used to receive data from GPS and to transfer the latitude and longitude to the PC to map by using the VB.Net language and this map is generated using Google Earth information.**

Key words: **GPS, Microcontroller, vehicle, PC and Map and Google earth.**

I. Introduction

The primary roots of vehicle navigation are lying in the field of shipping. Whenever the ships are spread over the ocean, it is difficult to owners to find out or to track their ships. Therefore definitely it is important to determine where the vehicle is situated at any time. And this need of vehicle tracking rose to avoid the any kind of vehicle thefts because the police can use these tracking reports to find out the stolen vehicles. In today's advanced technological world many systems require automatic identification of vehicle location i.e. effectively determine the geographic location of the vehicle and transforms the location information to remotely located server. In this project the efficient detection of vehicle location is the major goal and this system is implemented using so many advanced technologies: GPS, GSM and Google Earth information etc. GPS and GSM based vehicle location system provides very efficient results besides mapping information will give improving level of service quality [10, 11].

Overview of GPS:

Among all the advanced communication technologies GPS is the utmost technology and which provides very robust information of location and time in all weather conditions and at all times. Simply GPS is a global navigation system (GNSS) which is purely space based [1]. The US government is maintaining the GPS and it is free to all with a GPS receiver. GPS project was initiated in the year of 1973 by overcoming all the limitations of early navigation systems.GPS system contains totally 24 satellites and it became fully available in the year of 1994.

Over view of GSM:

In the era of mobile communications GSM (Global system for Mobile Communications) is the top most standard. 80% of the global mobile market uses the GSM standard [1]. In more than 212 countries over than 2 billion people uses the GSM [2],[3]. Therefore the subscribers are able to use mobile communication throughout the world by arranging the international roaming arrangements among mobile network operators of different countries. In the GSM signaling and as well as speech channels are digital in nature, where preceding technologies are not digital. Therefore GSM is considered as second generation mobile phone system. The greatest feasibility of GSM is it provides advantage to both the parties i.e. to consumer and network operator. The consumers may get benefit from the roaming and network operators may select many GSM equipment vendors.

Objective

- Implementing GPS based navigation/tracking system.
- Implementing vehicle location system by using the information from GPS and GSM/GPRS by transforming information with following features:
  - Obtaining the information of the vehicle after every specified time interval.
  - Transmission of location information to monitoring or tracking server.
  - Implementing a display unit by using Google earth to display vehicle location in the maps.
  -

The remaining of this paper is discussed as follows. In Section II, we discuss about related work and from section III we clearly explain about the system model. Hardware design process is illustrated in section IV. Section V consists of analysis of results and finally conclusion of this paper discussed in section VI.

II. Related work

Several cutting edge technologies are proposed by many researchers for the purpose of vehicle tracking. And these methods mostly consist of GPS, communications, Remote control server etc [2]-[6]. In this particular paper we proposed a systematic method to track the automobile vehicle's status by using the integration of several communications and embedded systems like GPS, GSM, CPU, and Serial Interface etc. Google earth [3] is used to visualize the location data of the vehicle, which is sent by the GSM and provided by GPS.

III. System Model

The block diagram for system model for the proposed system is shown in figure 1.

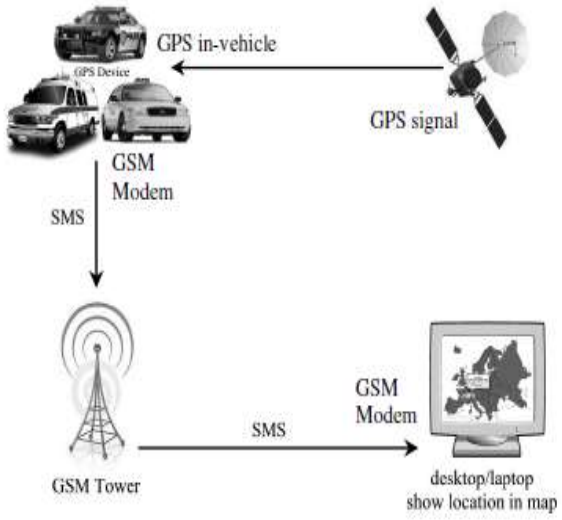

Fig 1: The block diagram of Advanced Vehicle Tracking System on Google Earth Using GPS and GSM

The two major design units in the implementation of this navigation system is

- In-Vehicle unit
- Tracking Server/Monitoring Station.

In-Vehicle-Unit:

In vehicle unit is the core part of this navigation system and it will be installed in the vehicle. The responsibilities of in vehicle unit are to gathering the information about current location of the vehicle and transmitting location data information to the tracking server. The In-vehicle Unit comprises with GPS Receiver which is responsible for getting location information of the vehicle by using satellites as a pair of latitude and as well as longitude, Micro Controller Unit (MCU) is the key part to observe the GPS information from GPS receiver and then retrieve the location information and then transmit this data to tracking server using GSM modem. Third important component of the in- Vehicle unit is GSM modem. GSM modem is responsible for transmitting the vehicle location information to the Tracking server. The block diagram for In-vehicle unit is shown in figure 2.As shown in figure the GPS antenna is located towards the sky and it receives the locations information from the GPS system satellites. RS 232 is the serial interface module and it transfers the GPS information to the to the CPU unit. Micro Controller Unit (MCU) is the key part to observe the GPS information from GPS receiver and then retrieve the location information and then transmit this data to tracking server using GSM modem and another key feature of the MCU is it controls the operation of GSM/GPRS modems using AT commands.

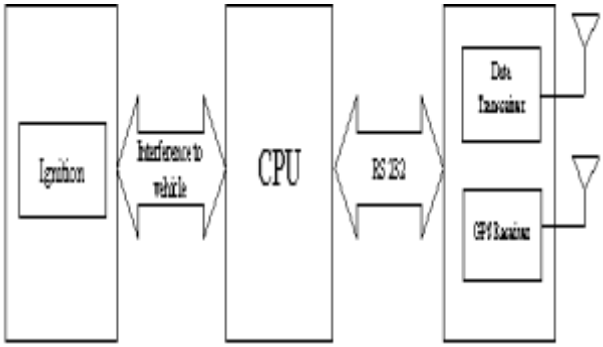

Fig.2 :In-Vehicle Unit Block diagram

For reliable communication GSM an external antenna is required by the GSM modem for efficient transmission and reception of information.

Tracking Server/Monitoring Station:

All the information send by the In-vehicle unit which is placed in automobile vehicle is received and stored in data base which is maintained by tracking server. This database has the feature that to access by any authorized user using web interface. Therefore authorized users can easily track their vehicles. To receive the information from the in vehicle unit the tracking server has an additional GSM/GPRS receiver. Tracking server unit mainly consists of GSM/GPRS modem for effective communication with In- Vehicle unit, data base to store the vehicle information and web interface to provide user interface. Figure 3 to illustrate the tracking server.

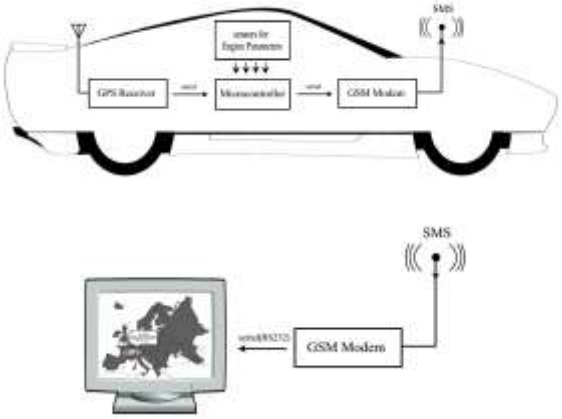

Figure 3: The system architecture: GPS tracking and GSM modules.

IV. Hardware Specification

As shown in figure 4 the tracking unit has two main inputs: the first one is obtained by the GPS output and it is NMEA 0183 based sentence format. And another input is from OBD-II (ON Board Diagnostics port). Using AT commands the unit sends the SMS.

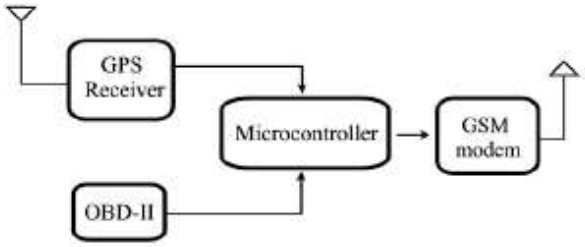

Fig 4: Schematic diagram of in-vehicle tracking unit

Most of the automobiles support OBD-II (On-Board Diagnostics port), which is a universal protocol designed for automotive purposes to retrieve the errors of CAN (Controller Area Network) bus of the MCU. SIM900D type GSM modem is used and it uses AT commands. And the transmission parameters are set as the data is in 8N1 format, Baud Rate is as 19200bps and the value for flow control is 1. MediaTek MT3329 type GPS receiver is installed and it stands up to 10HZ update rate. GSM modem at In-vehicle unit send the information in MCE to another GSM modem at recipient side. And finally after the processing all the information is appear on Google Earth. The tracking unit's external view is shown in figure 5.

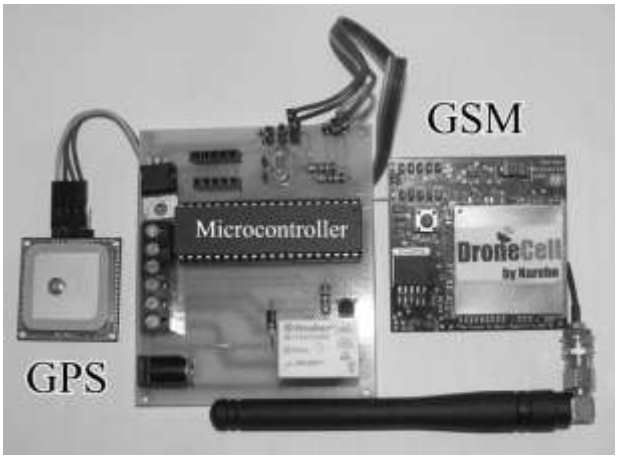

Fig 5:. The tracking unit hardware.

V. Results And Analysis

For the purposes of tracking and visual view we used the Google Earth software and it supports several GPS receivers. GPS module used in our project has NMEA 0183 type protocol standard to transmit the GPS information. NMEA 0183 protocol has several sentences of 79 character length starting with $ character [4]. The location of the vehicle is determined by the $GPRMC sentence. MediaTek MT3329 GSM modem is used to send and receive the GPS information at In-Vehicle unit and monitoring unit consequently. The received information is processed and by using Visual Basic programming and Google Earth the location of the vehicle will display on Google maps.

Here we provide the analysis of results as step by step. In the first step the calls for the Mandalay map window and then by using serial comport the GPS information is transmitted as shown in figure 6.

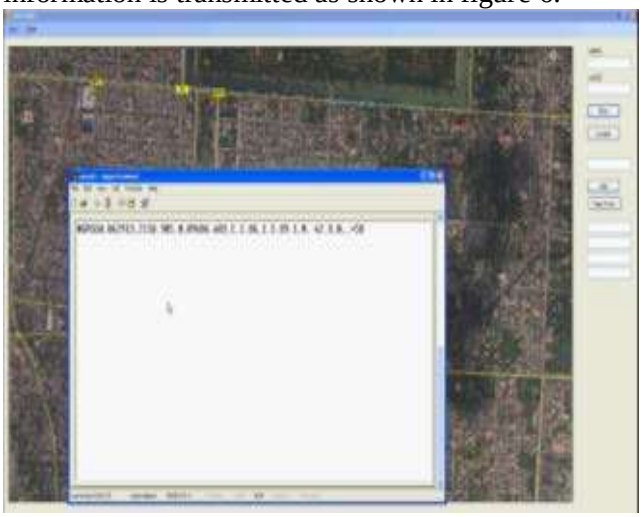

Fig.6 the testing with serial data for mapping display

With the incoming latitude and longitude values the position of the vehicle is illustrated in figure 7. By using the Google Earths the map is developed for the visual purpose. The position of the vehicle is represented with red mark.

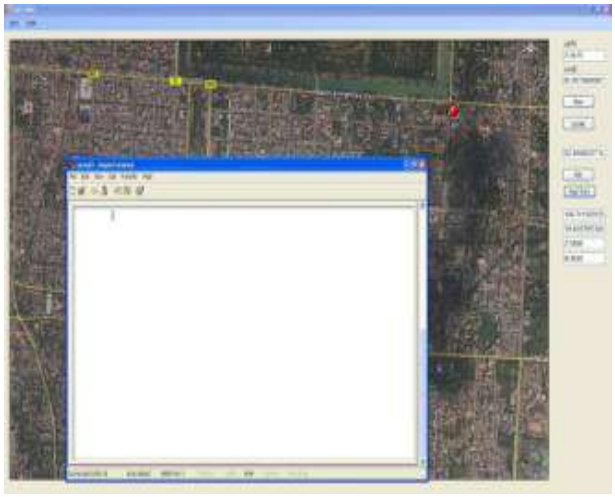

Fig.7 The test result

The consecutive position of the vehicle is shown inFig.8.

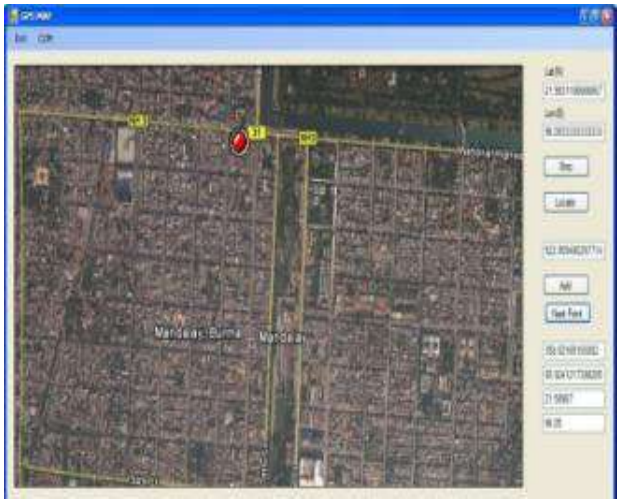

Fig.8 The consecutive test position

VI. CONCLUSIONS

The proposed Advanced Vehicle Tracking System on Google Earth Using GPS and GSM paper presents efficient location of the vehicle on the map by integrating the several communication technologies and display setups. The locations of the vehicle are displayed on Mandalay map by using Google Earth. GPS and GSM modems are used to track the location of the information and to send the information to tracking server.

REFERENCES

[1]. G. T. French (1996) Understanding the GPS. 1st Edition. Bethesda, GeoResearch Inc.
[2]. J.B. TSUI (2000) Fundamentals of Global Positioning System Receivers. 1st Edition. John Willey & Sons Inc.
[3] Yo O., Polak J.W., Noland R.W, Park Y et al.: Integration of GPS and dead reckoning for real- time vehicle performance and emissio. Wydawnictwo Springer GPS Solutions 4.
[4]. R. Parsad, M. Ruggieri (2005) Applied Satellite Navigation Using GPS, GALILEO, and Augmentation Systems. London, ARTECH HOUSE.
[5]. R. Steel et al (2001) GSM, cdmaOne and 3G Systems. Chichester, John Willey & Sons Inc.
[6]. T. Halonen et al (2003) GSM, GPRS and EDGE Performance. 2nd Edition. Chichester, John Willey & Sons Ltd.
[7]. NMEA Publication 0183, "NMEA0183 Interface Standard", 2nd Edition, National Marine Electronic Association, May 1991.
[8]. Telit Wireless Solutions (2008) GM862-GPS Modem
[9]. Microchip (2007) PIC18FXX8 Datasheet
[10]. Transportation District's Automatic Vehicle LocationSystem[online:]http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE/13589.html
[11]. Vehicle Tracking Systems Overview [Online:] http://www.roseindia.net/technology/vehicletracking/VehicleTrackingSystems.shtml
[12]. Telit Wireless Solutions (2007) GM862-GPS Hardware user guide. 1vv0300728 Rev. 8 - 20/09/07 World Academy of Science, Engineering and Technology 37 2010

Soujanya Kotte, born in India in 1984,received her B.Tech in Electronics and Communication Engineering from Jawaharlal Nehru Technological University, Hyderabad in the year 2005 and M.Tech degree in Digital Electronics and Communication Systems from Jawaharlal Nehru Technological University, Kakinada in the year 2009. She currently holds the position of Assistant Professor as a faculty of Electronics and Communication Engineering at Sir C R Reddy college of Engineering, Eluru, Andhra Pradesh, India. Her research interests include speech, image, video processing and non linear signal processing.

Hima Bindu Yanamadala, born in India in 1990,received her B.Tech in Electronics and Communication Engineering from Jawaharlal Nehru Technological University, Hyderabad in the year 2011 and Persuing M.Tech degree in Communication Systems from Andhra University , Vishakapatnam.Her research interests include speech, image, video processing, GPS and non linear signal processing.