GPS and GSM based Highway Monitoring and Control

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Abstract— in developed India information technology and electronics engineering are on fast track. Now a day’s digital electronics has become a very important part of new developed technologies. Our main idea is to develop an application using GPS and GSM technologies for tracking of vehicles information on highway. GPS system helps to calculate longitude and latitude of geographic location. It communicates with 4 satellites to give position information. Based on four satellites information is delivered it mainly depends on time clock. As thus GPS technologies having high range of frequencies, the user can get the information as fast. GSM modem is used to track vehicle remotely through the mobile network. The paper includes the hardware part which include of GPS, GSM, Atmega microcontroller 89C51, level converter MAX 232, 16x2 LCD and software part. As the you send SMS through GSM as a status, the GSM will trigger and on the signal to the micro-controller circuit and it will identify the location using GPS and send a particular text message via GSM to the receiving members i.e. friend, family.

Key words: GPS Modem, GSM Modem, Microcontroller, MAX 232

I. INTRODUCTION

In shining India information technology and electronics engineering are on fast track. Now a day’s digital electronics has become a very integrate part of new technologies. Today practically it is impossible to avoid interaction with digital equipment’s. The world has gone digital and so India has also.

Development of GSM technology has made business and industry more competitive and profitable. The digital electronics and GSM technologies hand in hand will create the digital environment and digital homes. Hence we take an opportunity to present this project “GPS & GSM Based Highway monitoring and Control of vehicle”. This system has Global Positioning System (GPS) which can receive the coordinates from the satellites calculate other type of information. Tracking system is very important in developed digital world. The system is microcontroller based that composed of a global positioning system (GPS) and global system for mobile communication (GSM). This project used only one GPS device and a two way communication process is executed using a GSM modem. In our project we have come up with an idea of tracking the vehicles as well as to give the current status of the vehicle on the road. Here we are consuming so much time for making this type of tracking technologies to calculate geographic location of that particular area which is required for transportation research.

II. LITERATURE REVIEW

In today’s modern and digital lifestyle a lot of research done on vehicle tracking system along with some characterization such as car locking system, face detection of driver, network tracking and electronic alarm. This paper describes anti-theft system using GSM and GPS modem also continuous monitoring of desired vehicle. GSM operates in frequency range of 900 MHz to 1.9 MHz. The related electronic device is installed in a vehicle to enable the owner for tracking of vehicle place.

Hu Jian-ning: Li Jie; Li Guang-Hui describes an automobile anti-theft system using GSM and GPS module. The system is developed using high speed mixed type single-chip C8051F120 and stolen automobile is detected by the use of vibration sensor. The system remains in contact with automobile owner through the GSM module, for the safety and reliability of automobile.

Fleischer, P.B.; Nelson et al describes development and deployment of GPS (Global Positioning System)/GSM (Global System for Mobile Communications) based Vehicle Tracking and Alert System. This system allows inter-city transport companies to track their vehicles in real-time and provides security from armed robbery and accident occurrences.

Chen Peijiang, Jiang Xuehua, “Design and Implementation of Remote monitoring system based on GSM,” vol.42, pp.167-175. 2008. In the remote monitoring system based on SMS and GSM was implemented. Based on the total design of the system, the hardware and software designed. In this paper, the GSM network is a medium for transmitting the remote signal. This includes two parts that are the monitoring center and the remote monitoring station. The monitoring centers consist of a computer and communication module of GSM. The software-monitoring center and the remote monitoring station implemented by using VB. The result of this demonstration shows that the system can watch and control the remote communication between the monitoring center and the remote monitoring station.

Prof. Zing Xu et al, it is discusses a vehicle to vehicle Location-Based Broadcast communication protocol, in which each vehicle generates emergency messages at a constant rate. Message forwarding can help warning message reach vehicles beyond the radio transmission range. The authors propose a multi-hop broadcast protocol based on slot reservation MAC. Motion properties of vehicles are used to help with message relay. Two protocols to reduce the amount of forwarding messages were proposed system.
III. BLOCK DIAGRAM

![Block Diagram](image)

**III. BLOCK DIAGRAM**

**A. Hardware Specification**
- Microcontroller AT 89C51
- LCD Display
- Transistor as a switch
- Buzzer
- Power supply
- Level converter
- GSM Modem
- GPS Modem
- Ignition control

**B. Working Principle**
The system includes GSM modem that continuously tracks the vehicle location in the form of latitude and longitude. As you send SMS regarding status, the GSM will trigger the signal to the micro-controller circuit and it will identify the location using GPS and send a particular code (Text message) via GSM to the receiving members i.e. friend, family etc.

IV. SYSTEM ARCHITECTURE

**A. GPS Modem**

![GPS Modem](image)

The Global Positioning System (GPS) is a worldwide, satellite-based radio navigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system that provides geo location and time information to a GPS receiver anywhere on or near the earth where there is an unobstructed line of sight to four or more satellites. The GPS system operates independently of any telephonic or internet reception, though these technologies can enhance the usefulness of the GPS positioning information.

1) How does work?
Each GPS satellite transmits radio signals that enable the GPS receivers in your vehicle to count the satellite’s location, as well as the distance between satellite and your vehicles. The receivers then use these measurements to calculate where your vehicles are located on Earth and calculations latitude and longitude. A receiver needs signals from three GPS satellites to exact your vehicle’s position.

**B. GSM Modem**
A GSM modem is a wireless modem that works with a GSM wireless network. (Global System for Mobile Communication) is a standard developed by the European Telecommunications standards institute (ETSI) to describe the protocols for second generation (2G) digital cellular network used by mobile phones .GSM standard originally describes as a digital ,circuit switched network optimized for full duplex voice telephony. This expanded over time to include data communication, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS). Further 3GPP developed third generation (3G) UMTS standards followed by fourth-generation (4G) LTE Advanced standards, which do not form part of the ETSI GSM standard.

**C. Micro-controller 89C51**
It is compatible with MCS-51 products. 4Kbytes of in-System Reprogrammable Flash Memory and 128x8 Bit internal RAM. The device is manufactured by Atmel’s high-density nonvolatile memory technology. The AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. It consist of 32 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplexer serial port, on-chip oscillator and clock circuitry.

**D. Level converter MAX 232**
It is a level converter to use for GSM, GPS and microcontroller to communicate serially and interfacing between them.

**E. 16x2 LCD**
A 16x2 LCD is used for displaying position values. A 9v battery is used to power up the circuit. When we send command to LCD these command go to command register and are processed their. Data which we send to LCD can be any alphabet, digit or ASCII character.
Fig. 4: LCD

F. Buzzer
It is output device. When there is SMS received then Buzzer turns ON. Buzzer will take the attraction from other vehicles passing through it.

G. Transistor as a switch
Output of micro-controller is not enough to drive the buzzer directly. Therefore to drive the buzzer we are using transistor as switch.

H. Relay Driver
It is an output device. Output of microcontroller is not enough to drive the relay directly.

I. Car Ignition Control
We are using ignition control as an output. Controlling is takes place with the help of relays.

J. Power supply
This block converts 230V ac into 5V dc and 12V dc. 5V is required for microcontroller, level converter and LCD display. 12V supply is required for GPS and GSM and Buzzer.

V. MODEL VIEW

Fig. 5: Model View

VI. APPLICATION
1) You can locate your theft vehicle easily using your mobile without any extra cost.
2) It can be used for vehicles carrying to valuable materials, to keep track of the status of delivery and location of the truck at all times.
3) You can easily install in any vehicle such as cars, boats, trucks, trains and motorbikes.
4) The device is used in cops department and fire service.

VII. CONCLUSION
The project is all about controlling theft of a vehicle. The system is about making vehicle more secure by the use of GPS, GSM technology and a web application. It can also be beneficial for:

- This system user friendly, easily installable and easily accessible.
- This system is not limited to find out the location but also calculate the distance between two stations.
- With the help of ignition control we can control speed of the vehicle.
- It significantly reduce the time, manpower and operates without interference of humanoid.

REFERENCES