

Design of GPS and GSM based Smart Safety System

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Abstract— Now a days GPS technologies used in a many applications. One of the applications is tracking your vehicle and keeps regular monitoring on them. The heinous incident that outraged the entire nation have waken us to go for the safety issues and so a host of new system have been developed to provide security systems to women .This tracking system can inform you the location and route travelled by women, and that information can be observed from any other remote location. It also includes the web application that provides you exact location of target. This system uses GPS and GSM technologies. The paper includes the hardware part which comprises of GPS, GSM, ARM-7 microcontroller MAX 232, 16x2 LCD and software part is used for interfacing all the required modules and a web application is also developed at the client side. Main objective is to design a system that can be easily installed and to provide platform for further enhancement.

Key words: GSM based Smart Safety System, GPS based Smart Safety System

I. INTRODUCTION

A report compiled by the World Health Organization in 2015 stated that 38 percent of women around the world have been victims of sexual violence [1]. The National Crime Records Bureau of India reported that a woman is assaulted in the country every three minutes [2]. The police are not able to help, as information about the crime does not reach them in time, if at all. With the number of criminal acts towards women increasing at such an appalling rate, it is evident that a method is required from the technical community to ameliorate the situation. Today's world, women safety has become a major issue as they can't step out of their house at any given time due to physical/sexual abuse and a fear of violence. Even in the 21st century where the technology is rapidly growing and new gadgets were developed but still women's and girls are facing problems. Women are adept at mobilizing diverse groups for a common reason. They often work across ethnic, religious, political, and cultural divides to promote liberty. We are all aware of importance of women safety, but we must analyse that they should be properly protected. Women are not as physically fit as men, in an emergency situation a helping hand would be assistance for them. The best way to cur tail your probability of becoming a dupe of violent crime (robbery, sexual assault, rape, domestic violence) is to recognize, defence and look up resources to help you out of hazardous situation. If you're in dilemma or get split from friends during a night out and don't know how to find back residence, this device with your assistance when you need it. There are several app reduce the risk of sexual assault on women by informing control centre and their associates through SMS.

A. Various problems that we face

- 1) Critical condition when women is confused what to do.
- 2) To find the shortest path available.

This system has Global Positioning System (GPS) which will receive the coordinates from the satellites among other critical information. Tracking system is very important in modern world. This can be useful in soldier monitoring, tracking of the theft vehicle and various other Applications. The system is microcontroller based that consists of a global positioning system (GPS) and global system for mobile communication (GSM). This project uses only one GPS Device and a two way communication process is achieved using a GSM modem. GSM modem, provided with a SIM card uses the same communication process as we are using in regular phone.

This system is user friendly, easily installable, easily accessible and can be used for various other purposes. After installation system will locate target by the use of a Web application (HTML based application) in Google map. The system allows to track the target anytime and anywhere in any weather conditions.

II. SYSTEM OVERVIEW

It consists of two units one is transmitting side (WOMAN VICTIM) and other one is monitoring side as shown in figure 1.

A. Description of Transmitting Unit

1) GPS

GPS modules are popularly used for navigation, positioning, time and other purposes. GPS Antenna receives the location values from the satellites. GPS gives information about:

- Message transmission time
- Position at that time

2) GSM

GSM modem is used for transmitting and receiving the data. SIM 300 is a tri- band GSM/GPRS engine. It works on various frequencies i.e. EGSM 900MHz, DCS 1800MHz and PCS 1900MHz.

3) Microcontroller

The system uses a CMOS 8- bit microcontroller. It is based on RISC architecture. It comprises of 16k bytes of flash program memory, 1K byte internal SRAM and 512 bytes EEPROM.

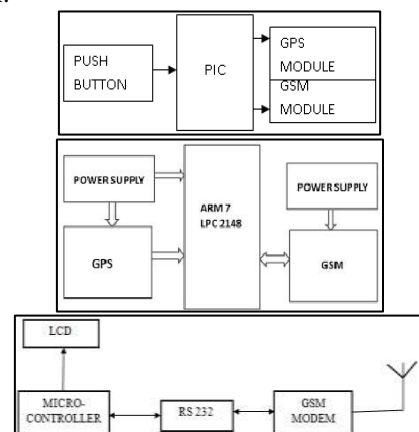


Fig. 1: Transmitting Unit Block Diagram

4) MAX 232

It is used for GSM, GPS and microcontroller to communicate serially.

5) 16x2 LCD

A 16x2 LCD is used for displaying location values. A 9v battery is used to power up the circuit.

6) Monitoring Unit

The monitoring unit consists of a GSM mobile and a Web Application. The GSM mobile will acquire the position of the vehicle (longitude and longitude) and then by typing those co-ordinates in web application owner of vehicle can get the exact location of the vehicle.

III. HARDWARE DESIGN

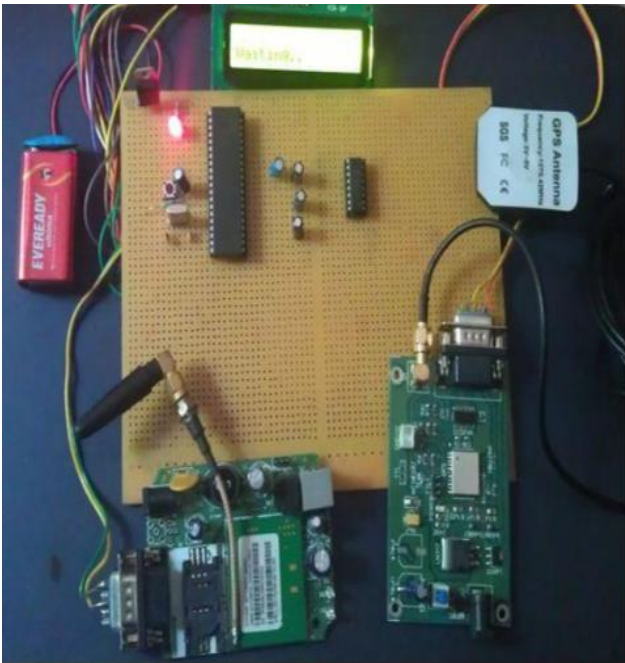


Fig. 2: Hardware design

A cost effective real time GSM and GPS based Automatic Tracking and Alert System with an accurate localization is presented in this report. Continuous and real time tracking is provided by combination of both Global Position System and GSM. On receiving the data from the GPS receiver, the current position of the object at any particular time and date is tracked by the system. This system has been experimented at various places and at distinguished times and the results are given in this report. This Smart and Intelligent GSM and GPS based Automatic Tracking and Alert System can find the coordinates of any object just by it being installed in the object. It helps in locating the object's location very easily. Using this embedded system one can track the position of any object if it is crossing the pre-determined area with the help of GPS and GSM. This magnificent design continuously monitors a moving object and reports the status of the object location on demand to the owner. For doing so an LPC2148 microcontroller is interfaced serially to a GPS Receiver and GSM Modem. By using GSM Modem the position of the object containing latitude and longitude can be send to a predefined number might be of family member and SOS. GPS modem has a property that it continuously gives the data indicating position of the object via latitude and longitude. This same data can be send to a cell phone at the other end from where one is demanding the

position of the object. The proposed tracking system can work as thefts prevent system. It can be assemble with vehicle for tracking as shown in figure 2.

IV. SOFTWARE DESIGN

A. GPS Modem

GPS engine board HOLUX GPSView.exe was used. GPSViewer.exe is compatible with Microsoft Pocket PC or other operation system alike. For testing the following procedure was used to test the GPS modem.

- Install Microsoft ActiveSync in the PC; refer to the Pocket PC manual for installation procedure.
- Setup the Pocket PC cradle to Desktop PC UART port. Microsoft ActiveSync will detect Pocket PC automatically.
- Double click the GPSViewer.exe on the PC, then Holux GPS Viewer.exe program will install automatically.
- Open "GPS Viewer" on Pc.
- Setup Baud rate: 4800, then push "Scan" bottom to scan the COM Port. Select the COM Port (COM1 COMIO), then push "Open GPN" bottom.
- Select "GPS Status" to show the satellite diagram as shown in figure 3.

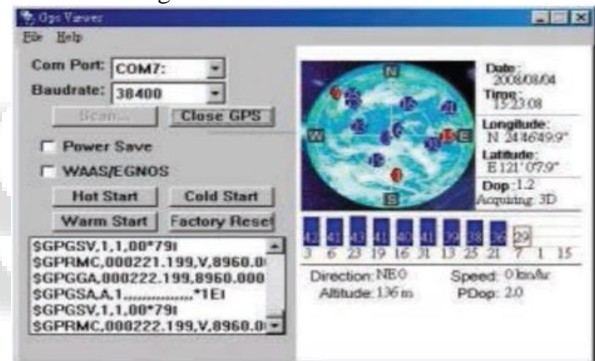


Fig. 3: Snapshot of GPS Viewer with Satellite Diagram

B. GSM Modem

To test the GSM module, it is connected with the computer. After that following procedure is adopted. A valid SIM card is inserted into the GSM modem. The SIM card must have adequate balance so that it is able to send and receive SMS. GSM modem is connected to the computer. A wireless modem is selected for communication. World Health Organization, Global and Regional Estimates of Violence against Women.

- The baud rate of 9600 is also selected for the modem.
- Start>Programs>Accessories>Communications>Hyper Terminal.
- COM port for mobile is chosen.
- Type AT command in the main window, if after pressing Enter, "OK" is observed then it shows that the GSM modem works properly.

V. EXPERIMENT RESULTS

GPS receiver is used to get information of the current position of the object. It is connected to the microcontroller through its transmit pin through a relay used to control the operation of GPS receiver. When latch is enabled, GPS receiver continuously sends data to the receive pin of the

microcontroller and the required information of longitude and latitude is extracted by the program. The complete prototype developed was tested at different locations. When the object tried to cross the predefined area, the GSM

modem sent the coordinates received by the GPS module to user in the form of SMS (Short Message Services). The accuracy of the device is nearly perfect.

S. N.	Location Coordinate send by the system	Coordinate on Google map	Name of location	Error (approximate)
1.	26°73'4365 N 83°43'1143 E	26.730826 N 83.4312541 E	NIELIT Hostel MMM University campus	20 meters
2.	26°75'4565 N 83°41'1043 E	26.7524464 N 83.411126 E	Kurnagath Cauraha Gorakhpur	16 meters
3.	26°75'4365 N 83°37'1143 E	26.7519865 N 83.3708659 E	GolGhar Market Gol Chauraha Gorakhpur	11 meters
4.	26°73'0465 N 83°37'7645 E	26.7304132 N 83.3768104 E	Taramandal Gorakhpur	5 meters
5.	26°77'4365 N 83°35'5565 E	26.7741582 N 83.3555979 E	Gorakhnath Mandir	9 meters
6.	26°75'4365 N 83°28'1143 E	26.75261 N 83.2845911 E	GIDA Gorakhpur	18 meters

Table 1: Experimental Result

The tracking system was tested at various places. When it found that object has crossed the bounded region, it sent an SMS containing coordinates of the object's location and also displayed these coordinates in the LCD. The interfacing of microcontroller with the GSM modem and GPS satellite is shown in figure 4.



Fig. 4: Snapshots of device before receiving the coordinates on LCD and Mobile.

VI. CONCLUSION

Smart and Intelligent GSM and GPS based Automatic Tracking and Alert System can be effective in the field of protecting pets/ disabled/ children etc. By using automatic calling system, this tracking system provides help by increasing the chances of tracking the victim. If the NGOs, which are working to find the missing persons, tie-up with tracking system then this problem of missing people could be resolved. The Tracking System developed in this dissertation has following applications:

- 1) The device can track any objects and provides the exact location on remote area.
- 2) Tracking Systems also act as security devices and greatly improve the chances of the object being recovered if it is missing so it provides a low cost application for theft control.
- 3) Places like museums and the zoos can use this tracking system for better information access and for the safety of animals and national treasures. If anyone tries to steal the treasures and animals then this system could be crucial in the field of safety and detection.

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