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Accident Intimation and Vehicle Security System

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ABSTRACT: In our day to day life, travelling around and coming home safely is a major concern. Rate of accidents per day is increasing rapidly. In most of the cases we are unable to save people because at the time of accident, no intimation was sent to hospitals. So when the ambulance reaches the spot, it becomes too late. Because of that many lives were lost. This gave us a motive to design a system which ensures our vehicle safety and security. They can be achieved by using the GSM, GPS technology. Using this system we can also prevent our vehicle from theft. This type of system is necessary in the automobile industry and must be explored in this area.

KEYWORDS: Accident, Security, GPS, GSM, Vehicle.

I. INTRODUCTION

This project mainly involves the intimation of accidents and also providing security to our vehicle. The system is designed to detect accidents. The GPS module is used to track the location of the vehicle. GPS will be installed to monitor the live location of the vehicle. Even if someone tries to start the vehicle without owner permission, it sends alerts to the owner of the vehicle. The receiver, which can be pre programmed, will receive the signals and act accordingly. This process takes a very small amount of time, so that the user is alerted on time during theft and that can be saved during accidents.

II. COMPONENTS

Arduino UNO:

Arduino Uno is a microcontroller board, which consists of 14 digital input/output pins. This board is made up of various microcontrollers. These 14 pins can be modified as i/o pins. It is an open source hardware. We can upload commands to the board using Arduino IDE software. The program written in this software is known as sketch. Now to integrate other components to our board, we use libraries. It can take power supply through usb cable or through a 9V battery.



Fig. 1 Arduino board(UNO)



GSM Module:

GSM(Global system for mobile communication) module is a typical hardware component which uses GSM technology to provide network to various locations. A SIM can identify themselves to the network of the carrier used. This modem provides TTL-level serial interface. In our paper, SIM900 A6 GSM module is used. This module supports frequencies ranging 850-1900MHz. The operating temperature of this module varies from -30 to +80 degree Celsius. This GSM module supports text messages as well as phone calls. It downloads 85.7 Kbps, upload 42.5 Kbps Its operating voltage varies from 3.3 V to 4.2 V.



Fig. 2 A6 GSM module

GPS module:

The GPS(Global Positioning System) module is designed upon many antennas and small processors which can receive data sent from many navigation satellites using the dedicated RF frequencies. In this paper, we have used a NEO-6M GPS module. It can communicate with up to 20 satellites on 50 channels. Its sensitivity is -161 dB. The default baud rate is 9600. Its working voltage varies from 2.7v to 3.6v. For communication an antenna is required, so it consists of an antenna with -161 dBm sensitivity, which can be connected through a wire provided. This module has a total of 4 pins which includes Tx(Transmission) pin, Rx(Receiver) pin, ground pin and the Voltage pin.

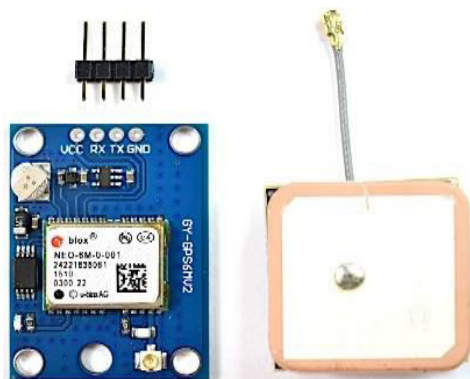


Fig. 3 NEO-6M GPS module



SIM Card:

A SIM(subscriber identity module) card is an IC which is made to save the IMSI number that can be used in authentication of subscribers on mobiles. A SIM card is compulsory in the GSM module in order to connect to the carrier network. This module will be connected to the carrier network, as soon as we insert a SIM card to this module.



Fig. 4 SIM card

Vibration sensor:

In this paper we used a SW-420 vibration sensor. Depending on the various vibrational and external forces applied, it changes its logic states. When vibration is not detected, then it produces logic LOW(0) output. Whenever we generate some kind of vibration, it produces logic HIGH(1) output. The working voltage of this sensor varies from 3.3V to 5V.

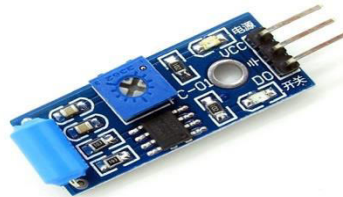


Fig.5 Vibration sensor

Accelerometer sensor:

We are using the ADXL335 Accelerometer in our paper. An accelerometer contains multiple axes, two axes in order to determine most two-dimensional movement, along with the option of a third for 3D positioning. Many mobiles these days use the three-axis models, whereas 4-wheelers basically use two-axis to determine the moment of impact. They are quite sensitive, they can even measure the minute changes in acceleration. By using this sensor we are going to find if any accidents occur.

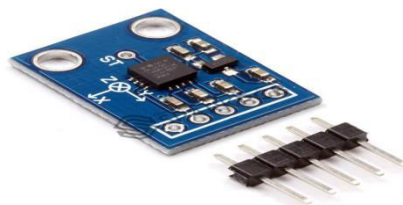


Fig. 6 Accelerometer sensor



III. IMPLEMENTATION

HARDWARE IMPLEMENTATION

Processing the data

To start the project, we required a platform to integrate the sensor data and find the commands to be executed according to the data. To fulfill this purpose, we have selected the Arduino Uno Atmega328p. It consists of 14 digital i/o pins. The operating voltage of this board is 5V. Its clock speed is 16 MHz consisting of a flash memory of 32 Kb. The Bootloader takes 0.5 KB. SRAM takes 2KB and EEPROM takes 1KB. The power supply to all the components is completely given through Arduino. Which is powered by a 9V battery in this prototype. The current supplied to the 3.3V pin is 50mA and per Input/output pin is 20mA. We require a device which is smaller in size, so this device fulfills the necessity. It acquires the required input from the vibration sensor and the accelerometer sensor and generates results according to the programs given.

Sensing the vibration

We have used SW-420 Vibration sensor in this project. Its working voltage ranges from 3.3v to 5v. We want to detect the vibratory force which involves starting a vehicle. This sensor detects the amount of vibration produced. We can set a limit to the sensor like a threshold limit so that if the detected vibrational force exceeds the given threshold limit, it sends the data to the Uno board. This data is received by Arduino uno and then finds the location of the vehicle and intimates the owner about the security breach.

Impact detection

We have used an ADXL335 Accelerometer sensor in order to determine impulsive forces like accidents. Its operating voltage varies from 1.8V - 3.6V. Power consumption is also very low and it consumes only 350 μ A of current. Now if an accident occurs this sensor detects the impulsive forces and sends the information to the arduino. If the arduino receives this information, it acts accordingly to the program. It collects data from GPS and sends it through GSM.

Tracking location

If any sensor sends information to the Arduino board, it sends commands to acquire the location coordinates from the GPS, which contains latitude and longitude information of the location. The GPS module used in this project is NEO-6M GPS, with a ceramic antenna, which is installed with a data-backup battery. Its baud rate is 9600. Our GPS module always locates the vehicle using navigation satellites. So whenever the Arduino sends the command, it gives the location coordinates to Arduino uno. We can get updated location coordinates every minute. Using that position coordinates we can track the exact position of the vehicle.

Intimating

After receiving location coordinates, the Arduino initiates the activation of the GSM module which sends an intimation to our phone in case of theft and to hospitals and necessary contacts feeded already. The module which we used is the Sim900A GPRS A6 module. The operating voltage of this module is 3.3v to 4.2v. We have to insert a sim card which is in working condition. After inserting a sim into the sim slot, it automatically connects to the carrier network of the sim company. We use the GSM module to send a message to user through mobile. When the Arduino receives the location coordinates, it sends a command to the GSM module to intimate the location details to the respective persons, to which we have programmed. Now the Arduino activates the GSM module and sends a text message.



SOFTWARE IMPLEMENTATION

We program the Arduino board through Arduino IDE which is an open-source software. It is used to write a program and upload it to the Arduino board. The ARDUINO IDE supports C and C++ languages along with few rules of structuring the code. The code requires only two basic functions for starting the program and the main program loop. In this software implementation, we used different sets of libraries to program the components like GPS, GSM, Vibration sensor and Accelerometer. The libraries used include GPRS_SIM900A-master, GSM_GPRS_GPS_GSM SHIELD, Tiny_GPS++, Tiny_GSM and we achieved our software functionality using them. We must write the code according to the required functions..



Fig. 7 Arduino IDE code Interface



Fig.8 AT commands execution

IV. RESULT

By using this system, we can detect if any accident occurred and can save the life of the person by sending an ambulance and medical assistance to the spot immediately. We can also find our vehicle, even if it has been stolen, by tracking the updated location coordinates of the vehicle. This system sends an alert message, in case of theft, along with the GPS location of the vehicle to our smartphone. By using this system we can send the ambulance to the spot where the accident took place even without calling.

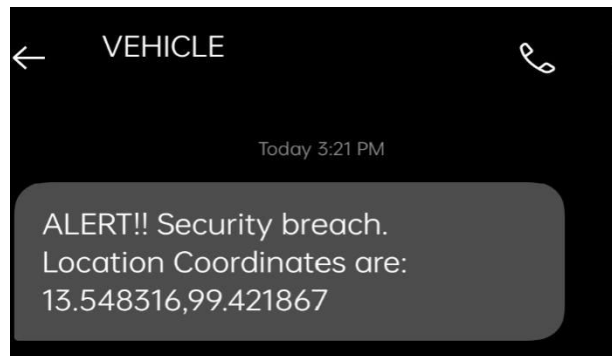


Fig.9 Theft intimation on smartphone

V. CONCLUSION

We have successfully implemented a system which detects accidents and intimates to emergency contacts. This system also prevents vehicle theft by intimating about the theft to the owner mobile number. Our system successfully sends the location coordinates of the vehicle to respective numbers given already during an accident as well as during theft.

VI. FUTURE ENHANCEMENTS

Vehicle security is one of the major things to be focused on in the automobile industry. In future we can track the number of vehicles nearby and update the user. We can develop methods to communicate with the neighbouring vehicles, so that we can get the information of the part of the road which we can not see. We can also find any obstacles present by this communication. We can also have the information of any road damages and traffic jams.

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