Vehicle Security System Using GSM Technology

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Abstract- *The main purpose of the vehicle security system is to design and develop vehicle theft control system and to prevent vehicle theft.This system is designed with the help of GSM modem, Arduino Uno and relay. This functionality is achieved by detecting vehicle status in theft mode . When some one tries to theft the vehicle then controller get interrupt and then GSM modem send message to owner that someone trying to theft his vehicle.The owner can then send back the SMS to GSM modem in order to 'stop the engine'.*

Keywords- GSM modem, Arduino Uno, sensors, LCD and interface, security

I. INTRODUCTION

In today's world almost every common man owns a vehicle. Now-a-days, as we know vehicle theft cases are increasing day by day, therefore there is need of vehicle great protection with reliable protection device. Because of this problem to reduce the vehicle theft, vehicle owner start implementing the vehicle security system on his vehicle. Vehicle theft security system using GSM technology ensures the guarantee to protect your vehicle from thefts.

Vehicle security system helps owner in theft condition to lock the engine. The security system is designed with the help of GSM modem, Arduino Uno, and relay system.

GSM technology is employed to make vehicle theft almost impossible. Mobile communication global system is globally accepted standard for digital cellular communication. Owner of the vehicle uses subscriber Identity Module inserted within his cell phone to send messages to GSM modem which is a part of vehicle theft prevention system and attached to vehicle. A GSM is a specialized type of modem which accepts the SIM card, and operate over subscription to the mobile operator, just like a mobile phone. From the mobile operator's perspective, a GSM modem looks just like a mobile phone.
The system operates in both enable & disable mode. The system is disabled when the vehicle is in the control of authorized person. By sending the respective message to the system the operation mode is changed by person remotely. If any interruption occurs, the signals are sensed by vibration sensor and SMS is sent to Arduino. The message about the theft of the vehicle is issued to the authorized person by arduino. The control signals are issued by the controller for locking the engine of vehicle. To restart the engine, authorized person needs to send the SMS.

II. METHODOLOGY

Vehicle security system consists of two sensors, vibration sensor and obstacle sensor. These are interfaced with Arduino microcontroller board. System works in two modes, i.e. active and inactive mode. Vibration sensor is used for sensing the vibration. When some unknown person tries to theft vehicle then vibration sensors senses this vibration which is place on vehicle engine with fine mechanical arrangement. Then vibration sensor sends the signal to microcontroller and then microcontroller gives the instruction to send the specific SMS to owner about theft of vehicle .The owner sends back the SMS to GSM modem in order to stop the engine.

In inactive mode of system, the power supply of both the sensor is disconnected with the help of relay module 1, so during the vehicle is in user's hand, there will be no feedback from sensors to the microcontroller.

And in active mode, sensors will send the feedback as relay module connects their power supply. User can switch into active and inactive mode with GSM (SMS) service; this means that there is not any physical switch present in the system.

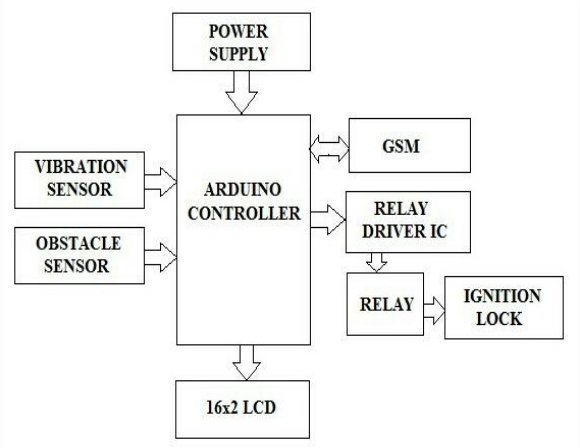

Fig 1.block diagram

1. VIBRATION SENSOR (SW 420):

The Vibration module based on the vibration sensor SW-420 (normally closed) and Comparator LM393 to detect if there is any vibration that beyond the threshold. The threshold can be adjusted by the on-board potentiometer.

- Comparator output, clean signal, good waveform, strong driving ability, >15mA
- Working voltage 3.3V ~ 5V

Interfacing with arduino:

Vcc of sensor to 5V pin of Arduino
Gnd pin of sensor to Gnd pin of Arduino
DO output signal pin of sensor to Arduino digital pin D3

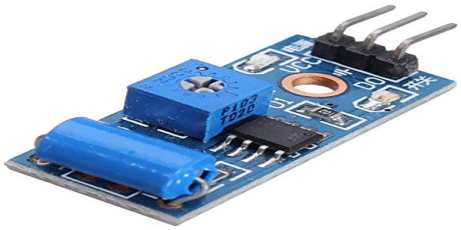

Fig 2. Vibration sensors

2. GSM MODEM (SIM900A) :

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A which works on the frequencies 900/ 1800 MHz.

- Operating voltage +12v DC
- Pin Specification
- Configurable baud rate from 9600-115200 through AT command
- SIM card holder
- Built in network status LED
- Inbuilt powerful TCP/IP protocol stack over GPRS for internet data transfer

Interfacing with arduino:

Tx pin of GSM module to Digital pin(D9) of Arduino
Rx pin of GSM module to Digital pin(D10) of Arduino
Ground pin of gsm module to ground pin of arduino

3. RELAY DRIVER IC (ULN2003):

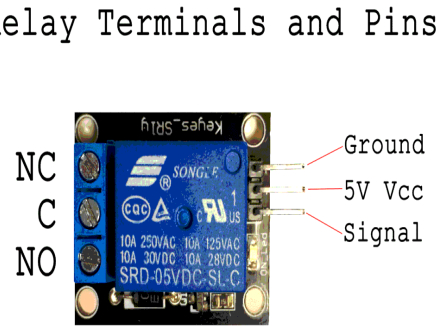

Fig 3. 5 volt dual channel relay module

This is a 5V, 10A 2-Channel Relay interface board. It can be used to control various appliances, and other equipments with large current. It can be controlled directly with 3.3V or 5V logic signals from a microcontroller. It has a 1x4 (2.54mm pitch) pin header for connecting power (5V and 0V), and for controlling the 2 relays. The pins are marked on the PCB:

GND - Connect 0V to this pin.
IN1 - Controls relay 1, active Low! Relay will turn on when this input goes below about 2.0V
IN2 - Controls relay 2, active Low! Relay will turn on when this input goes below about 2.0V
VCC - Connect 5V to this pin. Is used to power the opto couplers
The pins of the 1x3 pin header are marked on the PCB:
JD-VCC - This is the 5V required for the relays. At delivery, a jumper is present on this and the adjacent (VCC) pin.
VCC - This is the 5V VCC supplied on the 1x4 pin connector
GND - Connected to 0V pin of 1x4 pin header

Fig 4. Relay

4. ARDUINO MICROCONTROLLER

Arduino/Genuino Uno is a microcontroller board. It is based on the ATmega328P (datasheet). It has 14 digital input or output pins (from which 6 can be used as Pulse width

modulator outputs), 6 analog inputs, 16 MHz a USB connection, quartz crystal, an ICSP header , a power jack and a reset button. Arduino microcontroller contains everything that need to support the microcontroller; simply connects to a computer with a USB cable or power it with a AC to DC adapter or battery to start. You can tinker with your UNO without worring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

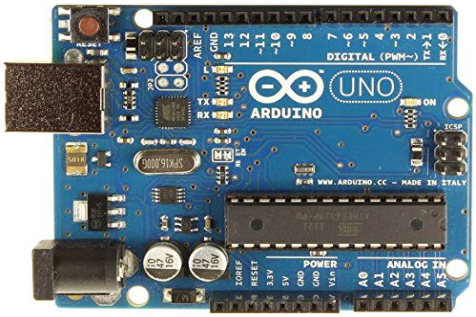

Fig 5. Arduino uno

5. LCD display

The JHD162A LCD module has 16 pins and it can be operated in 4-bit mode or 8-bit mode.

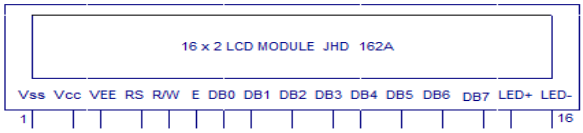

Fig 6. 16*2 LCD module

The functions and name of each pin of the 16×2 LCD module is as given below.

Pin1(Vss):Ground pin of the LCD module.
Pin2(Vcc): Power to LCD module (+5V supply is given to this pin)
Pin3(VEE): Contrast adjustment pin. This is done with connecting the ends of a 10K potentimeter to +5V and grounding and then connecting slider pin to VEE pin. The voltage at the VEE pin defines the contrast. The normal setting is between 0.4 and 0.9V.
Pin4(RS): Register select pin.The JHD162A has two registers that are command register and data register. Logic HIGH at RS pin select the data register and logic LOW at RS pin selects command register. If we make the RS pin HIGH and feed an input to the data lines (DB0 to DB7), this input will be treated as data to display on LCD screen. If we make the RS pin LOW and feed an input to the data lines, then this will be treated as a command (a command to be written to LCD controller – like positioning cursor or clear screen or scroll).
Pin5(R/W): Read/Write modes. This pin is used for selection in between read and write modes. Read mode is activated at logic HIGH and write mode is activated at logic LOW.
Pin6(E): This pin enables the LCD module. This pin will enable the module when signal is HIGH to LOW .
Pin7(DB0) to Pin14(DB7): These pins are data pins. The commands and the data are fed to the LCD module though these pins.
Pin15(LED+): Anode of the back light LED. When operated on 5V, a 560 ohm resistor should be connected in series to this pin. In arduino based projects the back light LED can be powered from the 3.3V source on the arduino board.
Pin16(LED-): Cathode of the back light LED.

VOLTAGE REGULATOR

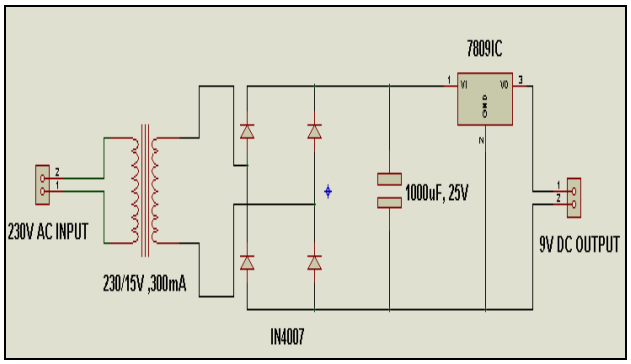

Fig7. Voltage regulator

7809 is a 9V fixed three terminal positive voltage regulator IC. The IC has features such as safe operating area protection, thermal shut down, internal current limiting which makes the IC very rugged.

Output currents up to 1A can be drawn from the IC provided that there is a proper heat sink. A 9V transformer steps down the main voltage, 1A bridge rectifier which uses 1N4007 diodes rectifies it and capacitor C1 filters it and 7809 regulates it to produce a steady 9Volt DC.

8. SIMULATION DIAGRAM

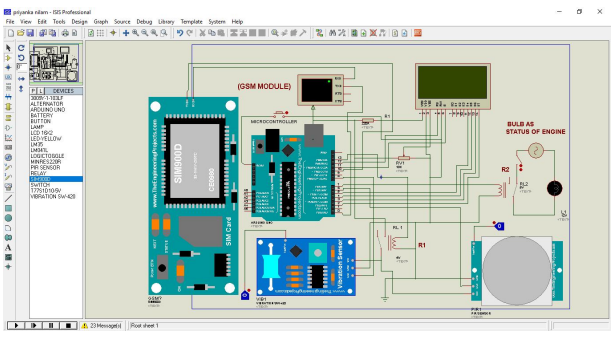

Fig8.Non-running condition simulation diagram

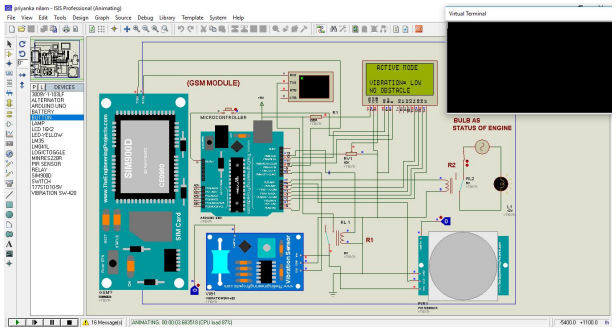

Fig9.running condition simulation diagram

The above diagram shows the running simulation status of vehicle theft monitoring and control system. The virtual terminal screen shows the space for output and feedback response of GSM system. Liquid crystal display interfaced with arduino uno microcontroller board, shows current parameter and status of vibration and obstacle sensor. Both the sensors and relay module are interfaced with microcontroller board with dedicated pins configuration, associated with arduino IDE software. As user switch on the bulb supply (bulb as status of engine), vibration sensor will send the feedback to microcontroller which will result in activating relay to module ultimately braking connection of bulb. GSM module will send the alert to user once relay2 is operated.

IV. CONCLUSION

As the vehicle theft is increasing day by day but users can found an efficient way to keep an eye on their vehicle without being very close to them. These system can put some control on the thefts and help avoiding them to some extent.

Using this system with addition to GPS module, user can determine exact location of the vehicle.

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