

## Anti-Theft Mechanism System with Accidental Avoidance and Cabin Safety System for Automobiles

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**Abstract:** - Safety-along with security plays a vital role in today's society. The goal of this project is to design an embedded safety and security system for vehicle by integrating and modifying existing modules. This system endures mainly with three modules namely Gas sensing module, Obstacle detection module and Anti-Theft alert system; these are interfaced with ATmega16 microcontroller. IR sensors transmit signal from its sensor head and again receive the signal reflected from an obstacle and instruct the microcontroller which alerts the driver with an alarm and controls the vehicle by stopping it. The gas sensor here is mounted inside the vehicle such that it senses the presence of the gases inside the vehicle cabin if there is any increase in the level of the toxic gases it informs to the microcontroller which alerts the persons inside the vehicle with an alarm and also sends a SMS to the authorized user through GSM. At the same time automatic ventilation will be provided to the vehicle. When an unauthorized person opens the car door, the car anti-theft system becomes active and gives indication by raising an alarm that the car is being under theft.

**Keywords:** - Microcontroller, GSM Module, Embedded System, Sensors, Antitheft System

### I. INTRODUCTION

Vehicle is the first place where safety starts. Hence we must need vehicles to equip it with the latest trend technologies and measures to make it a safe machine and also to make our self and our loved ones safe.

Always be aware that safety begins and ends with the person who drives the vehicle. The cars and trucks found today are equipped with high range of inbuilt safety accessories to protect their passengers. Before it seems to be just seatbelts, but now many more features have been included which are more advanced and efficient than seatbelts. Warning alerts and alarms are other security systems incorporated in the cars and trucks to alert us about various factors like exceeding speed limit or danger ahead. These are designed to make the passengers aware of crossing the limitations which is important in most of the time and in most cases. In the same way here an embedded system has been designed and implemented to make the journey of the passengers inside a vehicle safe and secure with various recently found safety and security measures.

### II. HARDWARE DESCRIPTION

In our proposed system an obstacle sensor i.e. the IR Sensor is mounted in front the car, the IR LED transmits the IR signal on to the object and the signal is reflected back from the surface of the object. The reflected signals are received by an IR receiver. The IR receiver can be a photodiode / phototransistor or a readymade module which decodes the signal and it detects the position of the obstacle and instructs the microcontroller about the obstacles ahead. Then microcontroller alerts the driver with an alarm and controls the vehicle by stopping it. In the same way a gas sensor is mounted inside the vehicle such that it senses the presence of the gases inside the vehicle cabin and informs the microcontroller if there is any increase in the level of the toxic gases. The microcontroller then alerts the passengers and the driver inside the vehicle with an alarm and also sends a SMS to the authorised user through GSM. The block diagram of the proposed system is shown in the fig.1 developed using ATmega16 microcontroller. The system has three modules namely the Gas sensing module, Anti-theft mechanism system and the Obstacle detection module and they are interfaced with the microcontroller. An ADC is mounted in these three modules for converting the analog acquired data in to the digital data for processing with the microcontroller through RS232 and the alarm is interfaced with the microcontroller to raise an alarm during the critical situations.

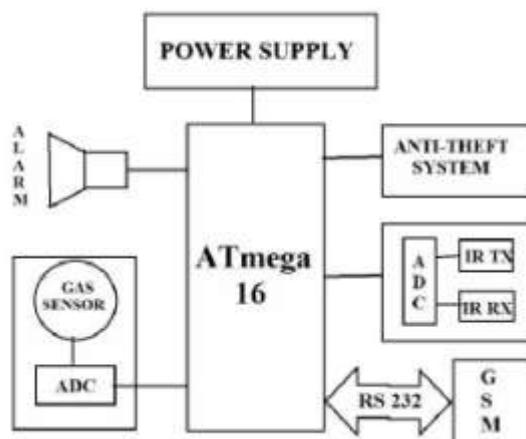


Fig.1: Block Diagram of the Proposed System

### A . Gas Sensing Module

The gas sensing module which sense the presence of toxic gases such as CO, LPG, Alcohol and other gases inside the vehicle. If critical levels of gases were found ,in brief if the CO exceeds 20ppm and the level of LPG exceeds 10,000 ppm and also the presence of alcohol is detected then the digital data from the gas sensing module is sent to the microcontroller which displays the information about the gas leakage inside the vehicle and results an alarm to alert the persons inside the vehicle .It also sends a text message to the authorized person through the GSM modem connected to the microcontroller such that remedy measures could be taken by the authorized person and to give proper medical treatment to them if required.

#### 1) MQ-6- Gas Sensor:

A MQ-6 gas sensor is used in this system which is a device that detects the presence of the carbon monoxide (CO) , LPG and various other gases in the environment.CO is a colorless and odorless compound produced by incomplete combustion. It is mostly referred to as the “silent killer” because it is virtually undetectable without using technology named detection technology. Peak levels of CO can be dangerous to humans depending on the amount present and length of exposure. Even smaller concentrations can be harmful over longer periods of time while increasing concentrations required diminishing exposure times to be harmful. MQ-6 sensors are perfectly designed to measure CO levels over a time and sounds an alarm before dangerous levels of CO accumulate in an environment, and therefore intimating the people adequate warning to safely ventilate the area or evacuate. Some system-connected detectors also alert a monitoring service that can dispatch emergency services if necessary. The interfacing of the sensor with the microcontroller and the developed gas sensor module is shown in the fig 2 and fig 3.

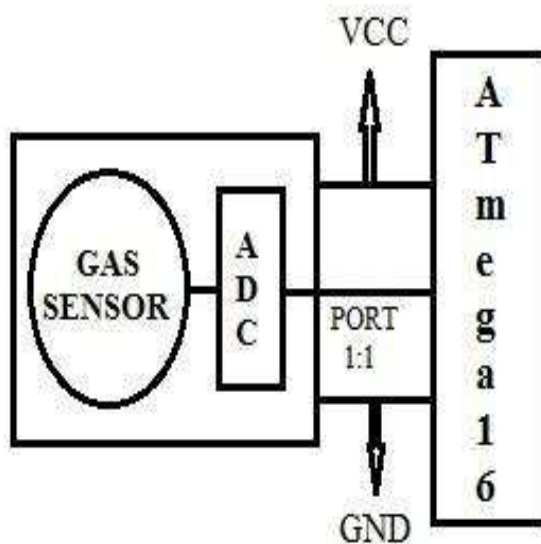
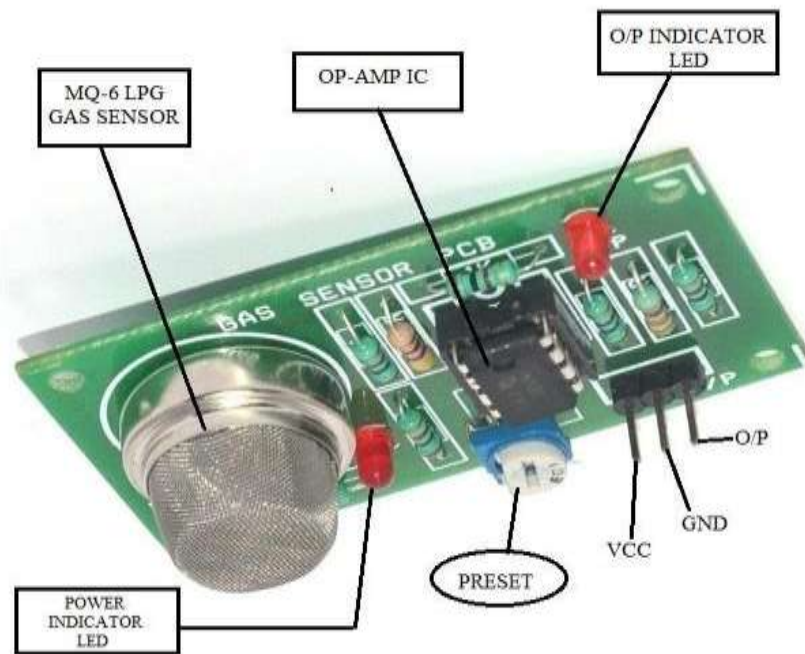


Fig.2: Interfacing Gas Sensor with Microcontroller



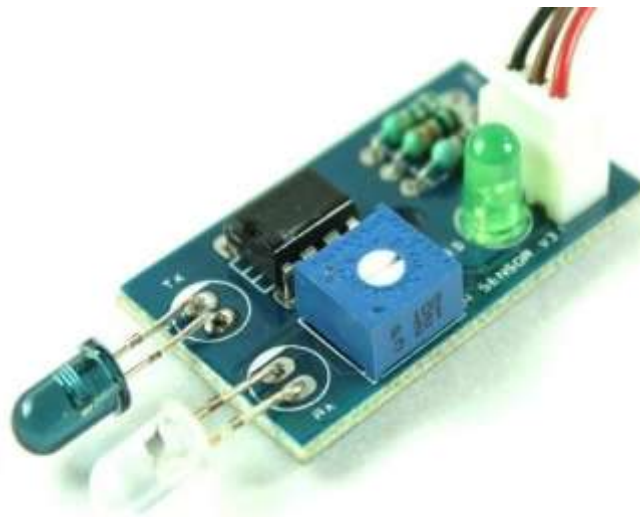
**Fig.3: Developed Gas Sensor Module**

The MQ-6 sensor also detect the presence of a dangerous LPG leakage in our home or in a service station, storage tank environment and even in vehicle which uses LPG gas as its fuel. This module can be easily placed into an alarm unit, to sound an alarm or provide a visual indication of the LPG concentration. This sensor has excellent sensitivity which combines with a quick response time. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. A simple electronic circuit is used to convert the change in conductivity to its corresponding output signal of gas concentration. This module may be used in various application areas such as Home, Industry and car .The main features of this sensor are:

- High sensitivity to carbon monoxide, LPG, propane etc.,
- Stable and long life

### **B. Obstacle Sensing Module**

The obstacle sensing module is used to sense the static obstacles in front of the vehicle such that, accidents results in unwanted parking of the vehicles and collision with trees and other objects especially during the night time could be avoided. These obstacles can be detected using various sensors such as IR sensors etc. The working principle of the obstacle sensor is shown in the fig.5.



**Fig.4: IR Sensor**

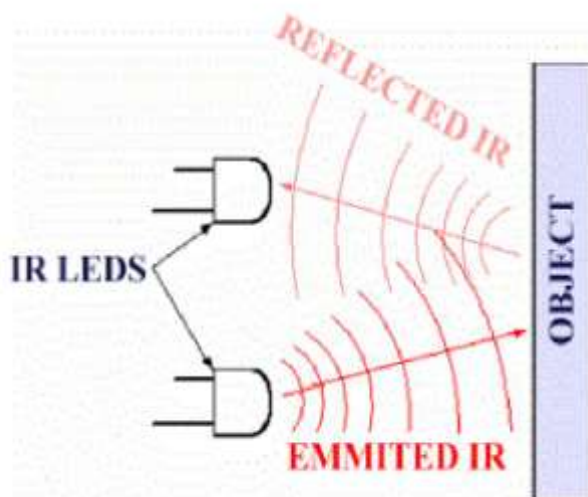


Fig.5: Working of IR Sensor

The basic concept of IR(infrared) obstacle detection is to transmit the IR signal(radiation) in a direction and a signal is received at the IR receiver when the IR radiation bounces back from a surface of the object. Here in the figure the object can be anything which has certain shape and size, the IR LED transmits the IR signal on to the object and the signal is reflected back from the surface of the object. The reflected signals is received by an IR receiver. The IR receiver can be a photodiode / phototransistor or a readymade module which decodes the signal.

### C. Car Anti-Theft System

The circuit, shown in Fig.6, is very simple and easy to understand. When car operated using key then switch S2 of the car is turned on, 12V DC power supply from the car battery is extended to the whole circuit through polarity-guard diode D5. Blinking LED1 flashes to indicate that the guard circuit is enabled. It works off 12V power supply along with current-limiting resistor R4 which is in series.

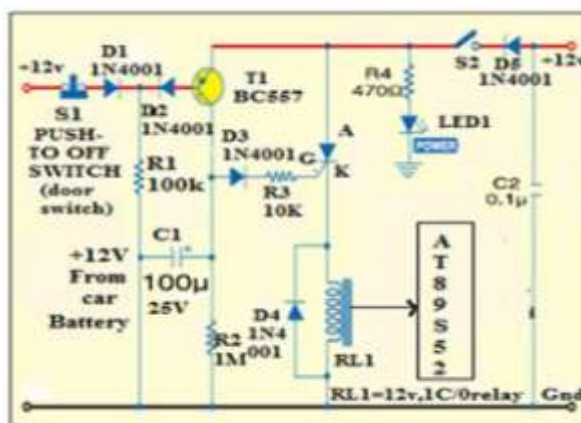


Fig 6.Circuit diagram for Car Anti-Theft System

When the car door is closed, door switch S1 is in „on“ position and 12V power supply is available across resistor R1, which prevents transistor T1 from conducting. In this position, antitheft guard circuit is in sleep mode. When unauthorized person opens the car door then switch S1 becomes „off“ . As a result, transistor T1 conducts to fire relay driver SCR1 (BT169) after some short delay introduced by capacitor C1. Electromagnetic relay RL1 indicates the microcontroller which energizes the alarm sounding to indicate that someone is trying to steal your car. To reset the circuit, turn off the switch S2 using car key.

### D. Microcontroller

Microcontroller is the heart of an embedded system. The Atmega16 is a low-power CMOS 8-bit Microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designed

to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers. The device is manufactured using Atmel's high density nonvolatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed in-system through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega16 is a powerful microcontroller that provides a highly-flexible and cost-effective solution to many embedded control applications. The microcontroller is always initialized in the active mode, if the gas sensor senses a gas and finds a critical situation then the information is sent to the microcontroller. The microcontroller first indicates an alarm to alert the passengers inside the vehicle and also an intimation message to the authorized user is sent in the form of SMS through GSM. The microcontroller uses AT+CMGS command to send the SMS where the GSM is connected to the microcontroller through RS232 cable. If anti-theft system becomes enable then it indicates the microcontroller about the inappropriate situation and alerts the surrounding environment with alarm.

### E. GSM Module

A GSM modem is a specific specialized type of modem which supports a SIM card, and operates based on subscription to a mobile operator, similar to a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem expresses an interface that allows many applications such as SMS to send and receive over the modem interface. The mobile operator even charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform the above tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages, as mentioned in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications. Due to some compatibility issues it can exist with mobile phones, using a dedicated GSM modem is usually more preferable to a GSM mobile phone. It should also be noted that not all mobiles support the modem interface for sending and receiving SMS messages. In particular, most smart phones, which includes Blackberries, iPhone, and Windows Mobile devices, do not support this GSM modem interface for sending and receiving SMS at all. Additionally, Nokia phones that use the S60 (Series 60) interface, which is of Symbian based, only support sending SMS messages via the modem interface, and do not support receiving SMS through the modem interface. The interfacing between the GSM and the Microcontroller and the developed module is shown in the fig. 7(a) and fig.7(b).

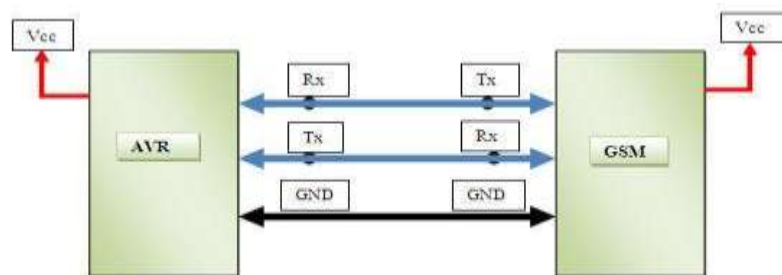


Fig.7 (a): Interfacing GSM with ATmega16



Fig.7 (b): Developed GSM Module

### III. IMPLEMENTATION

An embedded controller is implemented by using three sets of modules, i.e. the obstacle sensing module, the gas detection module and anti-theft system. The obstacle detection module is emerged in front of the vehicle such that it searches for the static obstacles. It then sends the corresponding signals to the microcontroller so that an alarm is provoked by the microcontroller as the first measure and stops the vehicle. The data flow diagram of the above modules is shown in the fig.8.

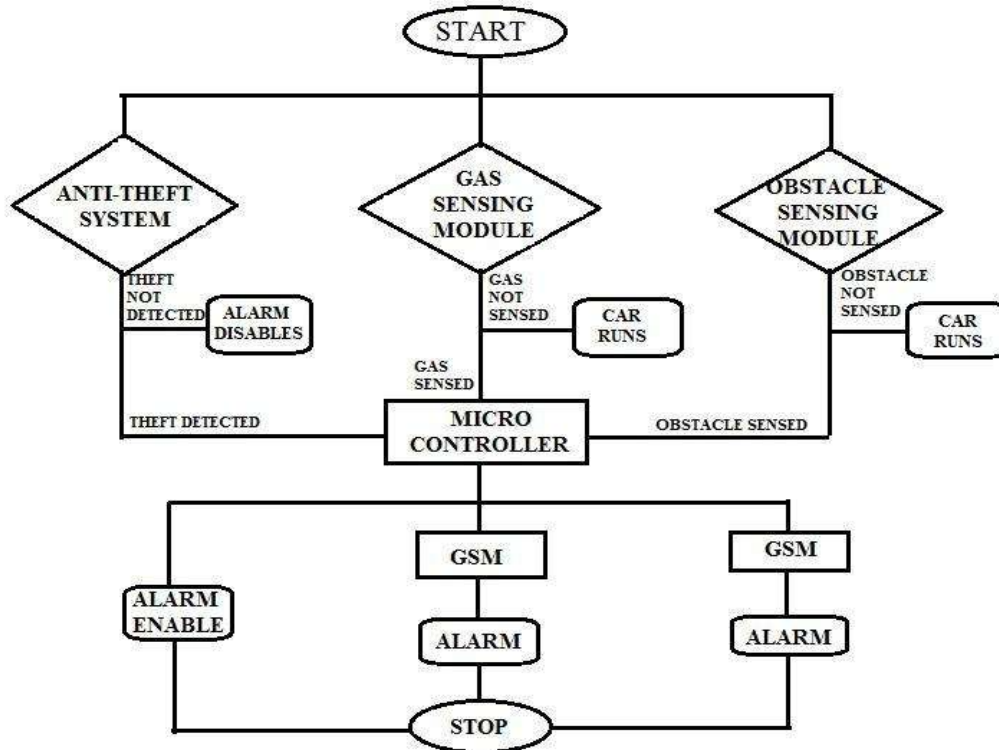


Fig.8: Flow Chart for Working of Obstacle Sensing Module, Gas Sensing Module & Anti-Theft System

In the same way the gas detection module which is placed inside the vehicle will continuously senses the presence of gas inside the vehicle cabin. When high levels of toxic gases such as CO greater than 20ppm, LPG higher than 10,000ppm and the presence of alcohol are found, then the corresponding signals are sent to the microcontroller which in turn raises an alarm to alert the persons in the vehicle. And in turn the GSM module commands to send an SMS to the authorized user about the alarming situation inside the vehicle using the AT+CMGS command. The GSM module is connected to the microcontroller by the means of RS232 cable as the communication between the GSM and the microcontroller is synchronized through the MAX232.

The car anti-theft system which placed inside the car gets enabled when car opened by any unauthorized persons so that the process continues and relay indicates the microcontroller which enables the alarm so that everyone nearby get to know that car is being under theft.

### Conclusion and Future Work

An embedded system has been developed which senses the toxic gases inside the vehicle and intimates the person inside the vehicle, the system even send an indication message to the authorized user through GSM such that remedy measures could be easily taken for the persons inside a vehicle. The proposed system also senses the obstacles or static objects in front of the vehicle so that the accidents due to static obstacles could be avoided. The system has been developed in a special motive that should protect not only the passengers inside the vehicle but also the persons around it results as pedestrians and also to prevent collision of vehicles with the other vehicle or obstacles such as trees. The developed system is highly helpful to prevent accidents which happen around the night time. The proposed system provides the vehicle safety from being theft. This system could be further enhanced with future technologies to provide further more safety and security to the vehicle systems.

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