PREVENTION OF VEHICLE ACCIDENT USING PNEUMATIC CYLINDER AND GSM   MODULE

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ABSTRACT

The Rapid growth of technology has made our life easier. This advancement in technology also increased the traffic hazards. Hence the ratio of road accidents which take place frequently increases causing immense loss of life due to poor emergency facilities. Main causes behind these road accidents include: lack of training institutes, unskilled drivers, poor road conditions, use of cell phone during driving, over loading and poor governmental plans in this regard. Our research provides a solution for accident detection and prevention for human life safety. It enables intelligent detection of an accident at any place and reports about the accident on predefined numbers. Our system consists of two parts, Alarming part with include of massaging part also and another is main part is protection part. The hardware includes Solenoid Valve, Ultrasonic Distance Sensor, Pneumatic Cylinder, GSM (Global System For Mobile Communication) Module, Buzzer, Reciprocating Compressor, Arduino. When distance is too short (given input distance value in Ultrasonic Distance sensor) between the vehicle and obstacle in time of accident time then ultrasonic distance sensor sense and our system working will start. Ultrasonic Distance sensor send massage to an Arduino then an Arduino send massage at a time to Buzzer ,GSM Module for send massage to given Mobile Number and Solenoid Valve. Solenoid valve release the required pressure to pneumatic cylinder them pneumatic cylinder piston up out and Absorb the accident obstacles pressure. This process form sense to absorb pressure complete in 0.1-0.5 seconds. Our system work as like safety air bags for car. Our designed system has been tested at different conditions and found to be effectively working by sensing to protection.

Keywords⸺ Arduino, GSM Module, intelligent detection, pneumatic Cylinder, protection, safety air bags of car

I.INTRODUCTION

The primary goal of the accident protections system is to save people in crashes and reduce heavy damage. Over the past decade, the use of auto mobiles has improved linearly, which increased the risk of human life. This

is because the emergency services are inadequate[1]. We use an alert system in this System that helps to strengthen the protection system of the crash system.

This device senses the occurrences of the accident when distance is too short (given input distance value in Ultrasonic Distance sensor)between the vehicle and obstacle in time of accident time then ultrasonic distance sensor sense and our system working will start[2]. Ultrasonic Distance Sensor send message to an Arduino then an Arduino send message at a time to Buzzer, GSM Module for send massage to given mobile number and solenoid valve[3].Solenoid valve release the required pressure to pneumatic cylinder piston up out and Absorb the accident obstacles pressure[4].

II. WORKING PRINCIPLE

A. Block Diagram-

The Block diagram consists of a Compressor, a GSM module, Auduino, an switch, Ultrasonic sensor , Alarm, Buzzer, pneumatic

Cylinder, Solenoid valve and power supply. All the implementation is sketched in figure 1.

  The Main module (heart of this project) is the micro controller (Arduino At328P) which provides high speed processing of the data because of the pipelining technique and ability to be used as a 16bit controller. The main advantage of using this controller is its better performance with high code density. The total controlling action will be done through this micro controller. Based on the signals given to the microcontroller that will be totally controlled at the output section.

 A GSM is used to get the signals and receive the signals from the satellites. In this project, GSM get the signals from the satellites and those are given to the microcontroller[5]. The signals may be in the form of the coordinates; these are represented in form of the latitudes, longitudes and altitude.

A GSM modem is used to get the messages from the mobile and as well as reading the message also[6]. There after sending the acknowledgement will be done. Before operating this GSM modem first we have to insert the SIM card in this modem[7]. Then the total receiving and sending the messages will be done based on this number. First the concerned person has to register for that number and second one is viewing and controlling section the vehicle like tracking and blocking[8].
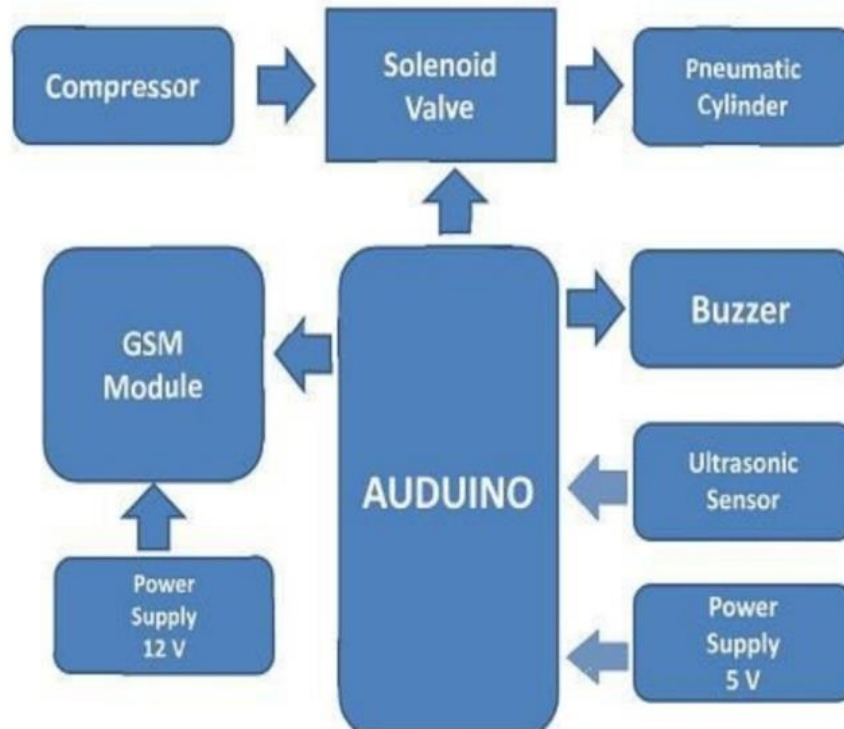
Figure 1: Block Diagram of System [2]

The maximum power supply required to operate the hardware circuitry is +5V DC voltage. Finally the serial communication used to interface GSM modules with the Arduino At328P microcontroller. All the components are interfaced precisely so that the accident detection and alert message sending are fully automated, so that the warning time is reduced significantly.

B. Components –

1.Solenoid Valve-

Figure 2: Solenoid Valve

Solenoid valve are used to control the flow of air. They are commonly used to shut off and release the air .Solenoid valve is electromechanically operated valve. It is necessary to start and stop the flow of air in the circuit to control air in the system.

2.Ultrasonic Distance Sensor-

Figure 3: Ultrasonic distance sensor

This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement

functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

There are only four pins that you need to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). You will find this sensor very easy to set up and use for your next range-finding project.

This sensor has additional control circuitry that can prevent inconsistent "bouncy" data depending on the application.

Features:

Operating Voltage=5V DC

Operating Current=15mA

Measure Angle=15°

Ranging Distance= 2cm-4

3.Pneumatic Cylinder-

Figure 4: Pneumatic Cylinder

Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce a force in a reciprocating linear motion. Pneumatic systems use compressed air to create rotary or linear mechanical motion and power applications. A double-acting cylinder uses compressed air to move a piston in and

out, while a single-acting cylinder uses compressed air for one-way movement and a return spring for the other.

4.GSM (Global System for Mobile communication) Module-

Figure 5: GSM Module

GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. More suitable network with robust features. It uses 4 different frequency bands of 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot.

Features:

High-Quality Product (Not hobby grade).

5V interface for direct communication with MCU kit.

Configurable baud rate.

Built- in Sim Cardholder.

Built-in Network status LED.

Inbuilt powerful TCP/IP protocol.

Internet data transfer over GPRS.

5.Buzzer –

Figure 6: Buzzer

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC

voltage and used in timers, alarm devices, printers, alarms, computers, etc .Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

6.Reciprocating Compressor-

Figure 7: Reciprocating Compressor

Reciprocating compressor used to produce high-pressure gas output. Required pressure 2 Bars minimum (200000 Pascal) A reciprocating compressor is the most famous type that uses in AC. A piston inside the AC compressor moves forward and backward to suck and compress the air.

7.Arduino –

Figure 8: Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software.

Arduino has 14 digital input/output pins in which 6 can be used as pwm outputs, a 16 MHz ceramic resonator, an icsp header, a usb connections ,6 analog inputs It, a power jack and a reset button. This contains all the required support needed for microcontroller. Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a

microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

C.Working –

The proposed circuit consists of just three components the Arduino board, the GSM module and the ultrasonic sensor. The whole circuit can be powered from 5V supply with at-least 1A of current. The GSM board may consumes 1A at peak so it must be power from a 12V / 1A supply, additionally Arduino can also powered from the same 5v supply either through DC jack or via Vin pin. The Tx and Rx of Arduino is connected with Rx and Tx of GSM respectively and ground connection is established between the two boards. The Trigger and Echo pins are connected to pin numbers 2 and 3 of Arduino respectively. The ultrasonic sensor HC-SR04 is powered from 5V output pin of Arduino. We are considered minimum distance is equal to the 5 cm if obstacles reached to minimum distance buzzer will start to buzz. at the same time it will blow the alarm and

send text messages to the user the same number is stored in the system. like wise it will work on infinite loop.
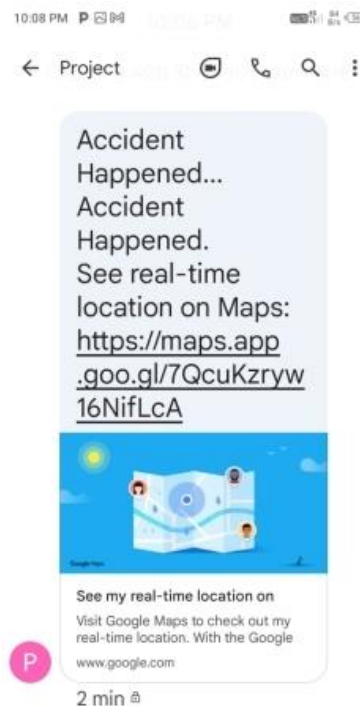
III. RESULT

A.Photos-

B.Project Working Video-

1.https://drive.google.com/file/d/1VmScdhQt_pl-CaNwBLtERsObrGfpBd1G/view?usp=drivesdk
2.https://drive.google.com/file/d/1Vnd9oOSPjT4dnBzx3waTywva-EIrkAqn/view?usp=drivesdk

VI. CONCLUSION-

As a result, system is sending SMS to the nearest Emergency assistance service provider from accident location .Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country.This design is a system which can detect accidents in significantly less time and sends the basic

information.

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