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Arduino based Four-Wheeler Accident Detection and Prevention System

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Abstract -*Nowadays we can track vehicles using many applications which helps to achieve personal vehicles, public vehicles, feet units and others. Furthermore there is a quick increment in the phenomenon of the road accident . This paper is about the system which will detect the accident and inform to the nearest medical services about it. This system will directly track the place where accident has occurs and the medical facility will go there. The main aim of this system to prevent accident as well as to detect the accident using GPS and GSM. The system compare between accelerometer, MCU, gsm&gps module which will support in sending message. Accelerometer help to detect axis value when vehicle is tilled in clockwise and anticlockwise direction as well as ir sensor is used to detect whether the wheels are rotating or not.*

1. INTRODUCTION

We have observed that over the past decade the usage of automobile has improved linearly due to this there is a increase in risk of human life. This happened because of insufficient emergency facilities. In this paper we also detect the alcohol if driver has drunk it. A 3 axis accelerometer sensor is also used to detect the accident. When the accident occurs, the axis coordinate will change and data will collect by the arduino. The accident will detect with the help of IR sensor and ADXL-335. The angle of rolling of car is indicated through message. This application helps in providing practical solution to the poor emergency facilities and can save the precious life.

2. SYSTEM DESIGN

In this project arduino is used for controlling entire process with a GPS receiver and GSM module. GSM module is used for sending the alert message with the coordinate and link to Google map. The GPS + GSM shield and the impact sensor will get power from the Arduino board itself. The circuit is first started the GPS + GSM module is turned on. The system waits till the GSM module gets a signal and is registered with the network. The system then goes on hold until the impact sensor gives a positive output. Once the accident is detected, arduino get the current location of the vehicle using the GPS module and the co-ordinates are then sent via messages to emergency services and/or contact the user to stored. The major components used in this device are:1) Arduino UNO 2) GPS eb-3531 with external antenna 3) GSM module with SIM card 300 4) IR sensor 5)MQ 3 6)ADXL-335 7)ultrasonic sensor

Fig -1: Block Diagram of Accident Detection System

Advantages of this systems are:

- The vehicle which has undergone to an accident can be identified by using tracking technology without any delay.
- The immediate medication will be provided to the accident victims in the remote area.
- Mobile number can be changed at any time.
- The system isn't police dependent.

Disadvantages of this system are:

- In some places where there is no provision of GSM networks it is difficult for communication
- This sensor is partial pressure sensitive and therefore may change sensitivity with change in altitude and elevation.
- The system cannot prevent due to others fault however if any mishap happens the system sends a message to the family members.

3. COMPONENTS

3.1Arduino UNO

The arduino UNO board is a microcontroller based on the atmega328. It contains 14 digital input/output pins , six analog inputs, a 16 MHz crystal oscillator, a power jack, a USB connection and a reset button. It has everything needed to help the microcontroller; simply connect it to a computer by using USB cable or power it with an ac-to-dc adapter.

The Arduino UNO vary from all previous boards because it does not use the Parallel-to-serial driver chip. Instead of it aurdino UNO features the atmega8u2 programmed as a USB-to-serial converter. Revision 2 of the arduino UNO board has a resistor pulling the 8u2 hwb line to ground, making it simple to put into mode. The Arduino UNO smd r3 is a microcontroller board based on the atmega328. Extra features coming with the r3 version are: - atmega16u2 instead 8u2 as USB-to-serial converter. - 1.0 pinout: added SDA and SCL; pins for twi communication fixed near to the aref pin and two other new pins fixed near to the reset pin, the IO ref that allow the shields to adapt to the voltage obtained from the board and the second one is a not connected pin, that is reserved for future purposes. - stronger reset circuit. In Italian "uno" means "one" and is named to mark the coming release of arduino 1.0. The UNO and version 1.0 will be the reference versions of arduino, the uno is the trending in a series of usb arduino boards, and the reference model for the arduino platform.

3.2 ADXL-335

Acceleration is a process of changing of velocity with respect to time and it is a vector quantity. Similarly, velocity is a speed and direction. Accelaration can be explain by changing speed and direction .sometimes both are changed simultaneously. ADXL 335 accelerometer, is a device that is used for measuring acceleration of any object. It measures the acceleration in the form of analog inputs, in three dimension direction such as x,y and z. It is low noise and less power consume device.For acceleration measure purposes it is interfaced with any type of controller such as microcontroller or arduino etc. It is used in construction working machines such as driving piles drilling and demolition etc., human activities machines such walking, dancing and skipping, running etc

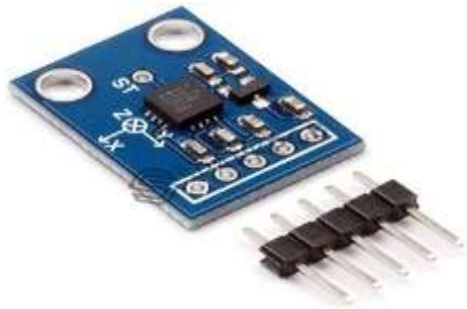

Fig -2: ADXL-335

The ADXL-335 is a small, thin, complete 3-axis ,low power accelerometer with signal conditioned voltage outputs. It can measure the static acceleration of gravity in the application of tilt-sensing , as well as in dynamic acceleration resulting from shock, vibration, or motion. We can selects the bandwidth of the accelerometer using the cx, cy, and cz capacitors at the xout, yout, and zout pins. Bandwidths can be selected to suit the application, with a range of 0.5 hz to 1600 hz for the x and y axes, and a range of 0.5 hz to 550 hz for the z axis. The adxl335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm plastic lead frame chip scale package (lfcsp_lq).

3.3 IR Sensor

Infrared sensors has two typeswhich is passive or active. Passive infrared sensors are used for infrared detection. Passive infrared sensors do not use any infrared source and detects energy released by obstacles in the field of view. They are of two types: quantum and thermal. Thermal infrared sensors use infrared energy as the source of heat . Thermal infrared detector has types which are thermocouples, piezoelectric detectors and bolometers. Quantum type infrared detectors give higher detection performance and are faster than thermal type infrared detectors. Quantum type detectors has wavelength dependent photosensitivity . Quantum type detectors are further classified into two types which are intrinsic and extrinsic types. Intrinsic type quantum detectors have photoconductive cells and photovoltaic cells. Active infrared sensors consist of two elements which are infrared source and infrared detector. Infrared detectors include photodiodes or phototransistors. The energy released by the infrared source is reflected by an object and falls on the infrared detector.

3.4 GPS Module

GPS is global positioning system and used to detect the latitude and longitude of any location on the earth. GPS module is used to find the location of accident . This device receives the data from the satellite for each and every time to find the location of accidents. GPS module send the data related to tracking position in real time, and it sends so many data. Format consists many sentences, in which we only need one sentence.

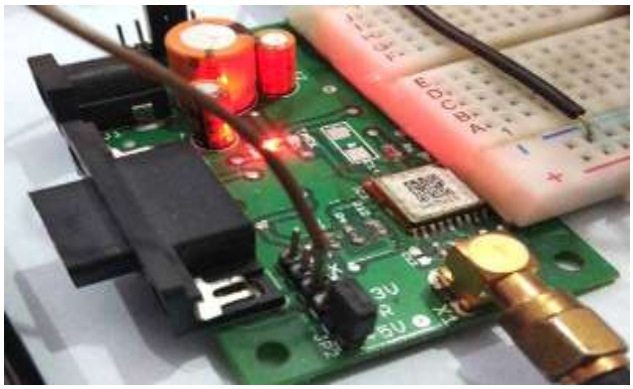

Fig -3: GPS Module

GPS satellites revolve around earth twice a day in a precise orbit. Each satellite transmits signal and orbital parameter allows GPS devices to decode and compute the precise location of the satellite. GPS receivers use this information. GPS receiver measures the distance each satellite by the amount of time takes to receive a transmitted signal. If the position is determined then gps system is use to find other information such as:

- speed
- bearing
- track
- distance to destination

3.5 GSM Module

GSM modem is develop by SIM com make sim900 and quad-band GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 mhz. It is very compact in size and easy to use in GSM modem. The modem is develop with RS232 level converter . Which is directly interface pc port .the baud rate configurable from 9600-115200 through at command. At start modem is auto baud mode. It is suitable for SMS and as well as for the data transfer application in m2m interface.

The modem needed only 3 wires (TX, RX,GND) power supply not required to interface with microcontroller or host pc. Using this modem, you will able to send and read SMS, connect to internet into the GPRS through simple at commands

Fig -4: GSM Module

Features:

- high quality product (not hobby grade)
- band GSM/GPRS
- 850/ 900/ 1800/ 1900 MHz
- SMA connector with GSM l type antenna.
- audio interface connector
- most status and controlling pins are available connector
- input voltage is 5v-12v d.

3.6 Ultrasonic sensor

Fig -5: Ultrasonic Sensor

The accident prevention system helps to avoid the accidents that will normally occurring on highways and city traffic.

These accidents are mainly happened due to various problem, unconsciousness, distance unknown between our vehicles. So now consider indian roads and we will have 2 ultrasonic sensors where one is placed in the front and another one behind the car. Due to this sensor, we can calculate the distance of other automobiles which are locating near us. Thus we can locate other cars and we can protect ourselves from accidents.

3.7 Alcohol Sensor MQ-3

The analog gas sensor - mq3 has the function to detecting alcohol, this sensor can be used to detect the alcohol. It has a high sensitivity to alcohol and low sensitivity to benzene and the sensitivity can be adjusted by the potentiometer. The material used for mq-3 gas sensor is sno2, which with lower conductivity in clean air. The sensor's conductivity is higher along with the gas concentration rising, use of simple electro circuit. The mq-3 gas sensor is high sensitive to alcohol, and it has good resistance to disturb of gasoline, smoke and vapor.

Character configuration:

• good sensitivity to alcohol gas

• simple drive circuit

• long life and low cost

• high sensitivity to alcohol

4. CONCLUSION

The proposed system is developed to provide the information about the accident occur and the location of the accident. It helps to easily provide the assistant and useful for the victim of the accident. This system uses GPS module to locate the vehicle. GSM is used to give the information of accident. The results of the proposed systems are satisfactory. After this system can be implemented by using sound sensor, in order to make it more correct and beneficial to detect an accident. This is extended with alcoholic detection also. If the person has taken alcohol who is driving then the vehicle will be stopped immediately by giving alarm. This can also be developed by interconnecting camera to the controller module that takes the photograph of the accident place makes tracking easier.

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