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Car Accident Prevention and Detection using Eyeblink Sensor and Accelerometer with Arduino

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Abstract:- This paper discusses the process of developing a accident prevention and detection system using short message services. With the growing population the use of car as became superfluous and this has led to increase in the number of accidents at the alarm rate. This project aims at detecting the accident and reporting the location of accident to the previously coded numbers. This helps in a speedy service from the ambulance and the concerned person. The GPS and GSM technology is used to locate the position of the car in the form of latitude and longitude coordinates and sends it through SMS. When accelerometer is triggered, it helps in detecting the accident and sending the signal to the Arduino of the system. This further helps in sending the message to the concerned person. When eyeblink sensor is triggered, it works against drowsiness and makes the driver aware of accident.

Keywords:- *Arduino,GSM,GPS,Eye blink sensor, Accelerometer.*

I. INTRODUCTION

We often come across the fact that when an accident occurs the people nearby have to manually call the ambulance which leads to waste of time. Hence there is a delay for emergency services to arrive at the location of the accident. Proposed system makes an effort to provide the emergency facilities to the victims in the shortest time possible. It incorporates an embedded system that contains GPS and GSM modules connected with an Arduino UNO. An eyeblink sensor is used to measure and controls the eye blink using IR sensor. The IR transmitter is used to transmit the infrared rays in our eyes. The IR receiver is used to receive the reflected infrared rays from our eyes. If the eyes are closed it means the output of IR receiver is high otherwise the IR receiver output is low. This to know the eye is closing or opening position of the eyes. This output is given to logic circuit to indicate the final output i.e. alarm. The accelerometer is used to measure the vibration and tilt condition at the time of accident. Global Positioning System(GPS) is used to identify the location of the vehicle .GSM is used to inform the exact vehicular location in the form of the longitude and latitude coordinates to the preceded numbers using an SMS.GSM module provides a two way communication by using a SIM card. Such a module works in the same manner as a regular phone. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

II. METHODOLOGY

The main elements of the prototype model of an automatic car accident detection and messaging are GSM and GPS module and Arduino UNO. The working of this model will be made in the following steps:

A. An eyeblink sensor is used to measure and controls the eye blink using IR sensor. If the eyes are closed it means the output of IR receiver is high otherwise the IR receiver output is low. If it is high then buzzer will be ON else the buzzer will be OFF.

B. The accelerometer is used to sense the vibration and tilt condition at the time of accident . If there is any change in the acceleration and beyond the threshold value.The Microcontroller of the hardware gets activated and at the same time, GPS module is triggered ON. It detects the latitude and longitudinal position of the car.

C. The latitude and longitude position of the car is sent as a message through the Global System for Mobile Communication(GSM)to the pre-saved numbers.

III. BLOCK DIAGRAM OF THE SYSTEM

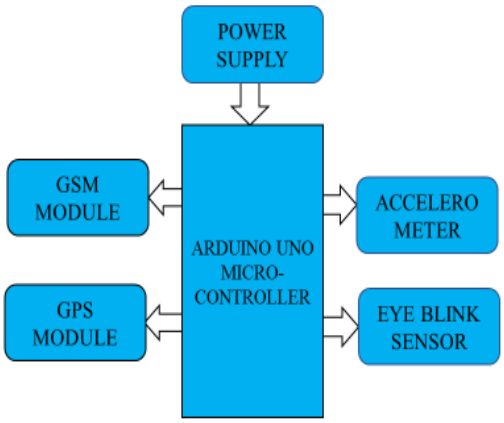

Fig 1:- block diagram of the system

IV. HARDWARE COMPONENTS AND DESIGN

A. Arduino UNO

Arduino UNO is a micro-controller board based on the ATmega328P.It has 14 digital input/output pins, out of which 6 can be used as PWM outputs, 6 analog inputs, a

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16MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. The board can operate on an external supply of 6 to 20 volts thought the recommended range is 7 to 12 volts. 3,5,6,9,10 and 11. Provide 8-bit PWM output with the analog write() function. External (non-USB) Power can come either from an AC to DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1 mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

B .GPS

The Navigation System with Timing and Ranging (NAVSTAR)Global Positioning System (GPS) was conceived as a ranging system from known positions of satellites in space to unknown positions on land, sea, in air and space. The GPS constellation consists of 24 satellites in 6 orbital planes with 4 satellites in each plane. The ascending nodes of the orbital planes are separated by 60 degrees and the planes are inclined 55 degrees. Each GPS satellite is in an approximately circular, semi-synchronous (20,200 km altitude) orbit. The orbits of the GPS satellites are available by broadcast - superimposed on the GPS pseudorandom noise codes (PRN), or after post-processing to get precise ephemerides, they are available from organizations such as the Jet Propulsion Lab *(JPL) or the International Geodetic Service (IGS) among* others. The GPS receivers convert the satellite's signals into position, velocity, and time estimates for navigation, positioning, time dissemination, or geodesy.

C. *GSM*

The GSM/GPRS modem utilizes the GSM network to send the location of the accident. The modem can be controlled by a microcontroller through AT Command set. The WavecomQ2403 is proposed for this system. It supports dual frequency (GSM/GPRS 900/1800MHz) with voice function and RS-232 interface. This modem supports all the AT Commands. GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM Modem used here is simple to interface serial interface used to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro controllers and computers. We have used highly popular SIM 300 module for all its operations. It comes with a standard RS232 interface which can be used to easily interface the modem to microcontrollers and computers.

D. *Eye Blink Sensor*

Here, we have used the infrared sensor CNY 70. It consists of Infrared transmitter which is one type of LED, which emits infrared rays generally called as IR Transmitter. Similarly, IR Receiver is used to receive the IR rays transmitted by the IR transmitter. One important point is both IR transmitter and receiver should be placed straight line to each other. The transmitted signal is given to IR transmitter whenever the signal is high, the IR transmitter LED is conducting it passes the IR rays to the receiver. The IR receiver is connected with comparator. The comparator is constructed with LM 2903 operational amplifier. In the comparator circuit the reference voltage is given to inverting input terminal. The non-inverting input terminal is connected IR receiver. When interrupt the IR rays between the IR transmitter and receiver, the IR receiver is not conducting. So the comparator non inverting input terminal voltage is higher than inverting input. Now the comparator output is in the range of +5V. This voltage is given to microcontroller or PC and so led will glow. When IR transmitter passes the rays to receiver, the IR receiver is conducting due to that non inverting input voltage is lower than inverting input. Now the comparator output is GND so the output is given to microcontroller or PC.

E. Accelerometer

We have used a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ±3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. User can select the bandwidth of the accelerometer using the CX, CY, and CZ capacitors at the XOUT, YOUT, and ZOUT pins. Bandwidth scan 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 550Hz for the Z axis. As like flex sensor, output of accelerometer is also analog one. It should be converted into digital before using it for further processing. Such accelerometer is used in many applications like mobile devices, gaming system, image stabilization, tilt sensing applications etc.

F. Buzzer

The Buzzer used is 1-8S LiPo Battery Voltage Tester low volt alarm buzzer and LED. It is used for testing 1-8S Lipo/Li-ION/LiMn/Li-Fe. The voltage display range :0.5-4.5V. The 1S Test Mode voltage range:3.7-30V and there is a low voltage alarm mode for 2-8S. The Alarm set value rang is OFF-2.7-3.8V.

G. Potentiometer

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name. Potentiometer are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

H. LCD

A liquid-crystal display (LCD) is a flat panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7 segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. LCDs are used in a wide range of applications monitors, televisions, aircraft cockpit displays, and indoor and outdoor signage.

V. SOFTWARE USED

A. Arduino Integrated Development Environment (IDE)

In order to program the Arduino Uno microcontroller, the Arduino Integrated Development Environment (IDE), a cross platform application written in Java that is self-installable, is used. The Arduino programs are written in C/C++. The Arduino IDE provides a powerful yet user-friendly programming environment. It allows compilation and uploading programs to the board through a USB connection the program for this project initializes and checks for a valid coordinate from the NEO-6Q GPS receiver and display on LCD. It then sends this coordinate to the LEON-G 100 GSM module to be transmitted through the SMS.

VI. ALGORITHM

Step 1: Start.

Step 2: Car starts and the eyeblink sensor gets triggered.

Step 3:If blinking rate is 0 then buzzer turns on else goto step 4

Step 4: Set threshold value for accelerometer.

Step 5: Read the acceleration value from the accelerometer.

Step 6:If loop condition is satisfied ,GPS detects the exact location of the car.

Step 7:If loop condition is not satisfied ,there is no accident.

Step 8:Display the coordinates in lcd.

Step 9:Send text message to the pre-saved numbers.

Step 10:Stop.

VII. FLOWCHART

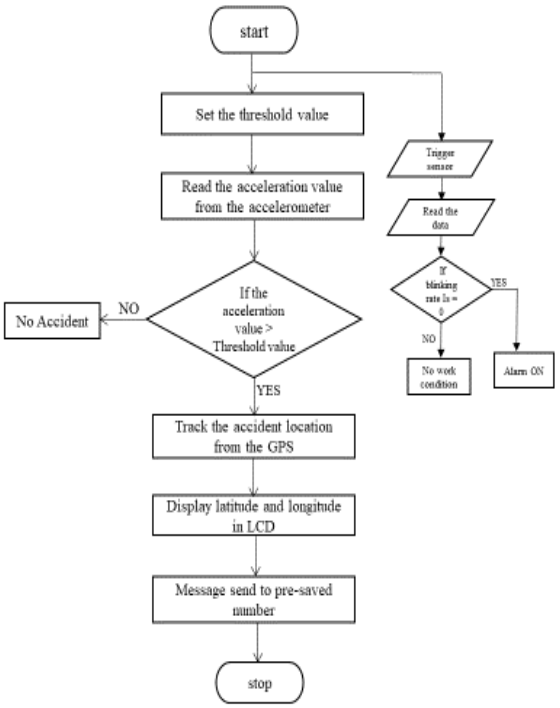

Fig 2:- Flowchart of the system

VIII. RESULT

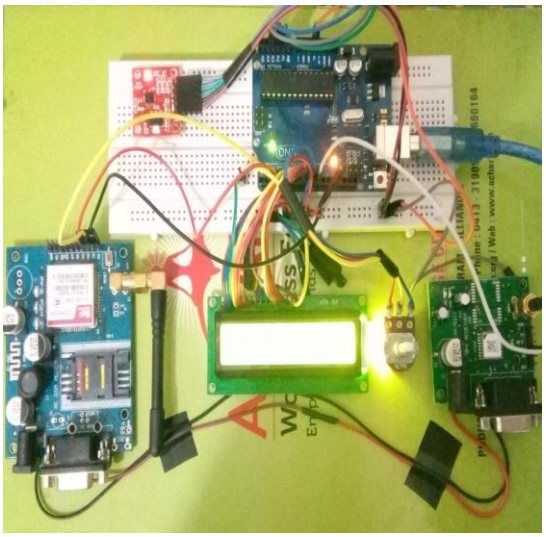

Fig 3:- Circuit Design

Fig 4:- Output

IX. CONCLUSION

Speed is one of the most significant causes of an accident. Nowadays, GPS receiver has become an integral part of a vehicle. Besides using in other purposes, the GPS can also monitor the speed and detect an accident. It can use a very cheap and popular GSM modem to send the accident location to the desired person. We have designed an intelligent, prototype automatic accident detection system which automatically detects accident using sensors and informs details about location taken from GPS though GSM (SIM900) to the desired person. Consequently, this will save the rescues from wasting their time in searching accident location.

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