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Study on Intelligent Automatic Vehicle Accident Prevention and Detection System

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ABSTRACT: The numbers of vehicles are increasing day by day worldwide. It produced high risk to accidents. Accident will occur every time and everywhere and cause worst damage, serious injury and dead. It's always better to prevent it.

Prevention can be done by applying automatic brake depending on situations or obstacle. It works where drivers may not brake manually but the vehicles can stop automatically due to obstacles. This work is about a system that can control braking system for safety. Using ultrasonic as a ranging sensor, automatic breaking system is implemented. To consider drunk and drive cases, in this project we have used an alcohol detecting sensor. It senses and detects alcohol gases and sends messages continuously to their family within every predefined time.

Even if accident occurs, by providing quick response, we can save lives. One approach to eliminating the delay between accident occurrence and first response is to use in-vehicle automatic accident detection and notification systems, which sense when a traffic accident is likely to occur and immediately notify emergency occurred. It can automatically detect traffic accidents using accelerometers and immediately notify a central emergency dispatch server after an accident, using GPS coordinates. Along with the data it will send the number of the vehicle also. This project uses different sensors and GPS, GSM module with microcontroller.

KEYWORDS: Vibration detection, GPS, GSM, MEMS, ARM, Emergency call system, Alcohol gas sensor, Ultrasonic sensor

I.INTRODUCTION

Main purpose of this project is to prevent accidents. Accident preventions are taken care with the help of automatic breaking system using ultrasonic sensor. Using ultrasonic as a ranging sensor, its function based on ultrasonic wave. After transmit by transmitter, the wave can reflect when obstacle detected and receive by receiver. The main target for this project is cars can automatically braking due to obstacles when the sensor senses the obstacles. The braking circuit function is to brake the car automatically after received signal from the sensor. To prevent these accidents of vehicles from taking place we are using Automated Emergency Brake Systems and Ultrasonic Sensors.

Now a day, many accidents are occurring because of the alcohol consumption of the driver or the person who is driving the vehicle. Thus drunken driving is a most reason of accidents in almost all countries all over the world. To avoid it, we have implemented, "Drunk and driving detection". We have integrated alcohol sensor with our system which will detect alcohol continuously. Once it is detected, system will trigger message to family person.

Even using these prevention measures, there are chances of occurrence of accidents. Today, it is very difficult to find that an accident has occurred and to find the position where it the accident occurred. It's more difficult for the lives of victims until any person know the information and informed it to the emergency vehicles like ambulance or to hospitals and if it occurs in remote areas it will becomes no hope to survive. To avoid these, different technologies like Global positioning systems (GPS) and GSM/CDMA are used. The GPS based accident identification module contains a Micro Electro Mechanical System(MEMS), vibrating sensor, fire sensor , infrared sensor and a GPS module connected to the processor unit. At the moment of accident, the vibration sensor or MEMS or fire sensor detects the accident gives the information to the microcontroller, which will display the information on LCD, switch on the buzzer unit and sends the

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information to the ambulance, police and owner/parents through GSM network. Here the system also provides the user to track the vehicle location, when he/she required. Here the position of the vehicle is also send to the mobile in terms of latitude and longitude. The main objective of this project is to detect the vehicle accident and transmit the location of the accident with the information of victim and type of accident to the medical help centre and police control room. So medical help centre and police control room will get the exact location by the geographical co-ordinates transmitted via message with the help of map.

II. BLOCK DIAGRAM

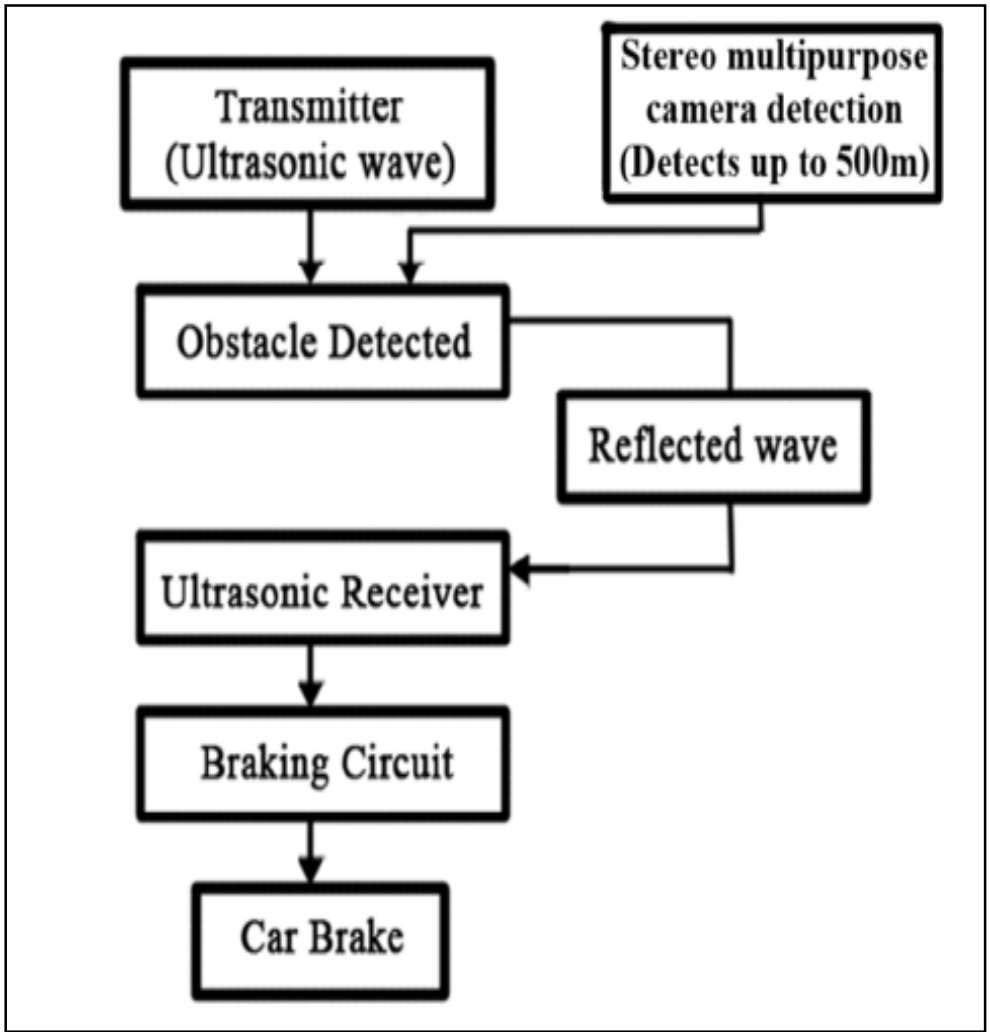

Figure 1: Car braking system

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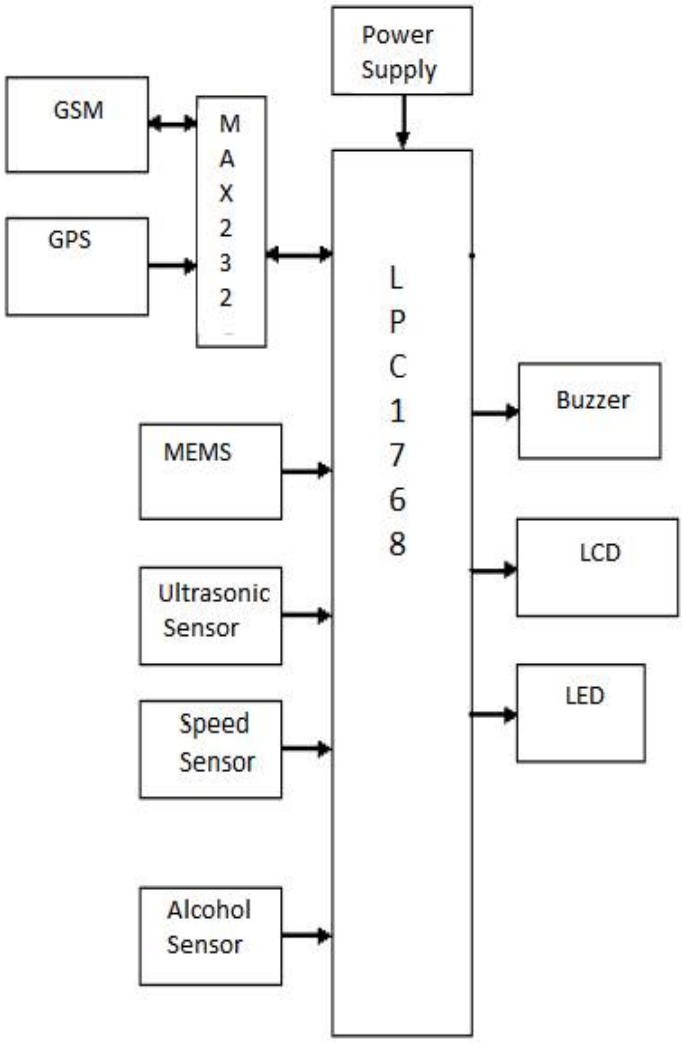

Figure 2: Block diagram

III.COMPONENT USED

A. ARM Based LPC 1768

The ARM7(LPC1768) microcontrollers are based on a 32/16 bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate [1]. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC1768/2/4/6/8 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

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B. GSM

The GSM architecture is nothing but a network of computers. The system has to partition available frequency and assign only that part of the frequency spectrum to any base transreceiver station and also has to reuse the scarce frequency as often as possible. GSM was originally defined for the 900 MHz range but after some time even the 1800 MHz range was used for cellular technology. The 1800 MHz range has its architecture and specifications almost same to that of the 900 MHz GSM technology but building the Mobile exchanges is easier and the high frequency Synergy effects add to the advantages of the 1800 MHz range.

C. GPS

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

D. Accelerometer

The accelerometer is used to detect the acceleration. It is the main sensor used to detect accident. It can give the data to detect the accident. The data used to detect the accident. Once the accident is detected the GPS sensor. Then the GSM modem sends the GPS data and number of vehicle to a predefined mobile number.

E. Ultrasonic Sensor

Ultrasonic sensors work on a principle similar to radar or sonar, which detect attributes of a target by interpreting the echoes from radio or sound waves respectively. An ultrasonic sensor creates high frequency sound waves and evaluates the echo which is received back by the sensor, measuring the time interval between sending signal and receiving echo to determine the distance to an object. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise.

F. Alcohol Gas Sensor

Wide detecting scope, Fast response and High sensitivity, Stable and long life Simple drive circuit

IV.WORKING OF SYSTEM

The main aim of is to design an ARM based GSM and GPS accident preventions, detection and tracking system. In this project LPC 1768 processor is used. When an accident occurs, MEMS gets disturbed and sends output signal to the processor LPC1768 so that the location is identified using GPS. Our work also provides with alcoholic sensor which will detects the driver's alcoholic percentage and control the ignition of the vehicle.

As the ARM processor requires 3.3 volts of supply, so a step down transformer of 230/12V is used to get the required AC output. To convert that AC supply to DC supply is done by using rectifier. DC output consists of ripples, to remove those ripples we use filter capacitors. To get output voltages of +5v & +12v we are using voltage regulators 7805 & 7812. Finally 3.3v is given to the ARM processor for functioning. ARM processor consists of two modes of operation i.e.; program mode and run mode. Program mode is used for dumping of the program into ARM processor from any external device such as computer. Run mode is used for the execution of program. For the purpose of accident detection we use run mode of operation. When an accident occurs, disturbance is created in MEMS which indicates a change in an angle of X-Co-Ordinate gives an analog signal output. This analog signal is converted into digital signal by using internal ADC of and hence the digital signal is given to ARM processor. We make use of three pins of MEMS namely X-Co-Ordinate pin(1),read pin(2),write pin(3). X-Co-Ordinate pin is used for the indication of change in angle; read pin gives the information or data to the ARM processor. When an ARM processor reads the signal from MEMS it indicates that an accident has been occurred .in order to locate the spot of accident we use GPS, output of GSM and GPS is given to MAX-232 .MAX-232 is a level converter which changes RS-232 to TTL and vice-versa. Because the LPC 1768 understands TTL format. When accident occurs GPS is activated and it gives the values of location in terms of Latitude and Longitude.

For example: Accident occurred at location of Latitude=1641.4095 Longitude=1725.3602, the same above values are sent to the mobiles using GSM for which the mobile numbers are dumped in the program. At the same time those values are displayed on LCD Display. Immediately after the accident detection, the air bag is released. Release of air bag is shown in our project by glowing LED. Hence by using MEMS, GSM and GPS accident location is detected and the information is sent to the mobile as well as LCD Display.

The scope of this work is also to develop a safety car braking system using ultrasonic sensor (Fig.1) and to design a vehicle with less human attention to the driving. The ultrasonic transmitter has a piezoelectric crystal that resonates up to a required frequency. This also converts the electrical energy into acoustic energy and vice versa. While transmitting

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the ultrasonic wave, there is a part which is ultrasonic wave generator that functions to generate ultrasonic wave. The block diagram tells us how the sound waves that are transmitted are totally reflected from a particular target and then back to the transmitter. There is an output that is produced to perform some kind of indication or a controlling function. There is a minimum distance from the sensor that is needed to provide a delay in time so that the echoes could be elucidated. The targets could have any kind of reflective form- also round objects. There are variables which could affect the working of the ultrasonic sensing which includes reflective surface roughness or target surface angle. After ultrasonic waves were produced, ultrasonic transmitter transmits the ultrasonic waves toward a road surface to find out the obstacle. The range that obstacle detected is depends on the range of ultrasonic sensors that used. The ultrasonic wave detects any kind of physical obstacle; hence it will produce a reflected wave. Once the obstacle is detected there is a reflector which reflects the ultrasonic waves. An ultrasonic receiver is used for this which does the receiving of the ultrasonic waves, reflected from the road surface to generate a reception signal. There is ultrasonic transducer that will transform back the sound wave to electrical energy. This signal amplified by an amplifier. The amplified signal is compared with reference signal to detect components in the amplified signal due to obstacles on the road surface. The magnitude of the reference signal or the amplification factor of the amplifier is controlled to maintain a constant ratio between the average of the reference signal and the average of the amplified signal. This allows the ultrasonic sensor to examine the existence of vehicles. Once this is complete the sensors give an alarm as to an obstacle detected. The processed signal will be send to the braking circuit.

V. CONCLUSION AND FUTURE WORK

With our system, a safe journey is possible which would decrease the injuries during accidents and also reduce the accident rate due to drunken driving. This system has also accident prevention technology which would reduce the accident of the vehicle in crowd areas. This vehicle accident prevention, detection and alert systems provide emergency response with crucial information at the earliest possible time. Reducing the time between when an accident takes place and when it is detected can reduce mortality rates. In future we can interface different sensors with this work, such as drowsiness detector, heart rate detector, etc. In terms of these we can really prevent accident and save life. Security sensors to identify theft can also be added. It can be reprogrammed to switch off vehicle and track the vehicle in theft. Safety car braking system technology could be further enhanced and same can be implemented in aircrafts, submarines.

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