Intelligent Automatic Vehicle Accident Detection System Using Wireless Communication

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Abstract: *Traffic accidents are one of the leading causes of fatalities. An important indicator of survival rates after an accident is the time between the accident and when emergency medical personnel are dispatched to the accident location. By eliminating the time between when an accident occurs and when the first responders are dispatched to the scene decreases mortality rates, we can save lives. One approach to eliminating the delay between accident occurrence and first responder dispatch 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. These in-vehicle systems, however, are not available in all cars and are unaffordable to retrofit in older vehicles. In this paper, such a system is described the main application of which is early accident detection. 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 too. This paper provides the following contributions to detecting traffic accidents via ARM7 controller. Here it is seen how arm controller, accelerometer, GSM connections, and GPS can be used to provide situational awareness responders. The codes are written and compiled in Keil ARMIDE.*

Keywords: *Vibration detection, GPS, GSM, MEMS, ARM, Emergency call system*

1. INTRODUCTION

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 GSM/CDMA and Global positioning systems 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 information to the ambulance, police and owner/parents through GSM network. Here the system also provide 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 controm 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.

2. METHODS AND MATERIALS

2.1 ARM Based LPC 2148

The ARM7(LPC2148) 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 aunique accelerator architecture enable 32-bit code execution at the maximum clock rate. 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, LPC2141/2/4/6/8 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.

2.2 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.

2.3 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.

3. SYSTEM DESCRIPTION

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.

4. WORKING OF THE SYSTEM
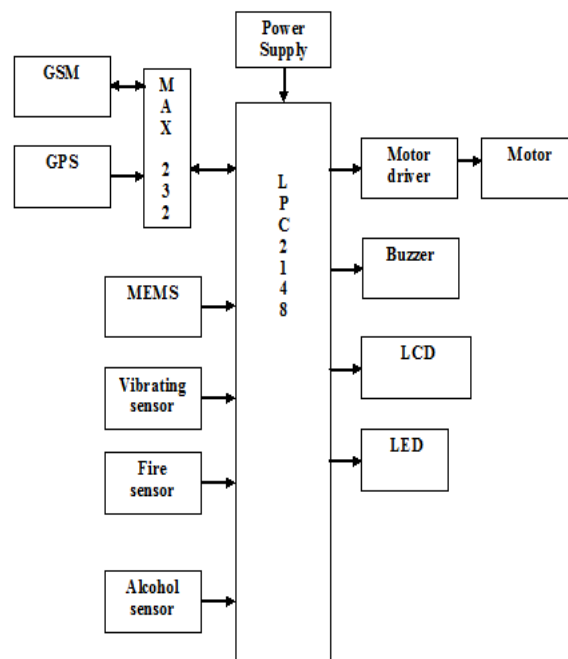
The main aim of is to design an ARM based GSM and GPS accident detection and tracking system. In this project LPC 2148 processor is used. When an accident occurs, MEMS gets disturbed and sends output signal to the processor LPC2148 so that the location is identified using GPS. If any fire accident occurs the fire sensor detects the fire and inform to the processor which will send the details to parents/police/ambulance through GSM network. The also provides with alcoholic sensor which will detects the drivers alcoholic percentage and control the ignition of the vehile.

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.Beacause the LPC 2148 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 ur 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.
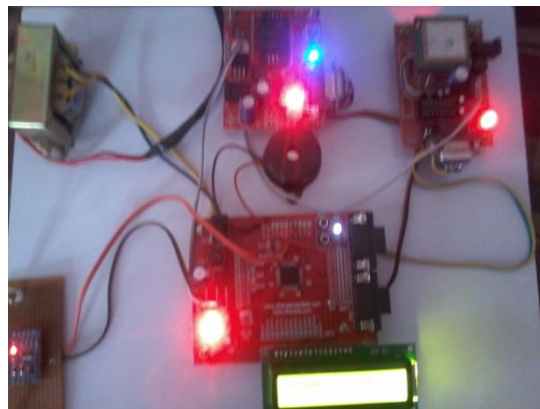
5. CONCLUSION AND FUTURE WORK

This vehicle accident detection and alert systems provide emergency responders 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. Conventional in-vehicle accident detection and notification systems, such as On Star, are effective in reducing the time gap before first responders are sent to the scene. These systems, however, are expensive and not available in all vehicles. To further increase the usage of automatic accident detection and notification systems, this system can be used to indirectly detect accidents through sensors, such as accelerometers. In future we can interface different sensors with this paper, such as alcohol detector, 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.

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