

# Accident Avoidance System in Automobiles Using CAN Protocol

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**Abstract**— Basic requirement and advancement in the technology in the field of vehicle safety has led to the implementation of the CAN protocol to avoid the accidents. CAN is used to overcome the point to point wiring between devices in the vehicle designing and provides a data communication with in the vehicle environment. Advantage of CAN based design provides flexibility and expandability for technology insertions. The major objective of this paper is designing of the vehicle to make it more intelligent and human interactive to overcome accidents. Sensors are used to measure the various parameters in a vehicles like speed, distance between vehicles, existing of alcoholic person in the vehicle and sending a warning signal to the driver if any one of the parameters varies, along with that detecting the collisions and mechanical shocks to the vehicle sensed by the sensor during the accidents and sending message to the any predefined numbers. Apart from this on occurrence of any accident in any remote area, then vibration sensor detects the vehicle collision and sends SMS immediately via GSM along with exact location provided by GPS to make the system completely reliable, safe and stable.

**Index Terms**— LPC1768 Controller, CAN (Controlled Area Network), GPS (Global Positioning System), GSM (Global System for Mobile communication), embedded, vehicle safety, Alcoholic sensor, Accident Detection and Ultrasonic sensor..

## I. INTRODUCTION

The main objective of this project is development of prototype model to avoid accidents in vehicles by establishing the communication between different ECU's (Engine Control Units) in automobiles using LPC1768 controller over Controlled Area Networks (CAN) bus. In this project we make use of LPC1768 controller which has built in CAN controller. CAN bus and devices like vibration sensor, Ultrasonic sensor and alcoholic sensor which are connected to the CAN bus.

One of the main aspect of this project is to check out the effective communication between the various devices and the vehicle to establish the different parameters like controlling, sensing, and other utilities which are involved in the same arena. The main advantage of doing this project is to have a control over the vehicles such that there can be no mishap during the time of accidents. The build of this project is entirely dependent on the master slave topology where the driver communicates and the action is received by the vehicles. We all know that there are two main convertors available ADC and DAC. ADC is used to convert input analog signal to digital format and DAC is simply the vice versa used at the output end. Reliability is

ensured when there is error free communication and so far this purpose to have this thing achieved need to ensure the error free transmission between the master and slave part.

Vibration sensor is used to detect the mechanical shocks and collision of the vehicle. Ultrasonic sensors are used to detect the distance from the obstacles therefore avoiding the collision which is based on the echolocation process. Alcoholic sensor is used to monitor the person, if the person is found to be drunk. The transmission will be automatically turned off.

## II. LITERATURE SURVEY

In [1], it is mainly focused on the accident avoidance system and has used various like Alcoholic sensor, IR sensor, Vibration sensor, alcoholic sensor along with that they have used GPS and GSM module to track the location of the accidents and send an information to the predefined number. The development board used in the project is ARM7 TDMI. It is being said that the objective of the project is being meet.

In [2], the major objective of this paper is to control the vehicle. Certain parameters have been taken into consideration such as pressure, speed fuel level and obstacle detection. The processors used in the development of the project is 16/32 bit ARM7 TDMI microcontroller. The results obtained were digitally controlling of vehicle with the rapid development of the embedded technology were the system provides high performance with low cost and high reliability.

## III. PREREQUISITES

To achieve the objective of the project, there is a need for the reliable, safe, secure and efficient system. The system requires the compact packaged of hardware and software. It must fulfill the necessary qualities such as real-time continuous monitoring and exact statistics series. It needs to store the data the exact location map interface. It must support mobility and less power consumption.

## IV. HARDWARE USED

### A. LPC1768 Controller

LPC1768 is a Cortex- M3 based microcontroller circuit for embedded application and it features a high bit of level integration and system efficiency. LPC1768 operates at CPU frequency up to 100MHz. the Arm Cortex-M3 CPU incorporates a 3 stage advanced pipe line unit and uses a Harvard architecture. It involves local instruction sets along with data buses to carry information's as well for peripheral communications. Apart from this it includes pre-fetch unit which is not worthy for supporting branching techniques.

The processor has an extensive use due to its higher level of integration and low power dissipation. One of the major aspect of using LPC1768 is due to its wide range of system enhancement and it operates at a clock frequency of 120MHz. It involves three stage pipelining unit and the architecture is dependent on Harvard topology.

### B. CAN (Controlled Area Network)

CAN stands for Controlled Area Network. It is serial asynchronous half duplex two wired communication protocol. CAN is mainly used for communication between the various electronic devices in network.

CAN protocol was invented by Robert Bosch GmBH in 1983 to make automobiles smart and intelligent thereby making them more reliable, safe and fuel efficient. Earlier communication between the devices in the vehicle was done with point to point communication, which led to the system complexity and increased e.m.f effects in the system.

To overcome these wiring complexity CAN protocol was developed, to make the electronic devices in the vehicle to communicate with each other over the common serial bus. Thus reducing wiring complexity and the bulkiness of the system.

### C. Vibration Sensor

This is a device used to measure the piezoelectric effect. Piezoelectric effect is the phenomenon, when a pressure is applied to the piezoelectric sensor, due to the mechanical stress, electrical voltage is generated. The piezoelectric sensor measures the changes in pressure, acceleration, temperature, strain or force and convert them into equivalent electrical charges. Vibration sensor is mainly designed for the security purpose.

When a vibration sensor detects the vibration, it send a signal to controlling unit of Omni-directional of high sensitivity.

#### *D. Alcoholic Sensor*

This sensor is designed for the detection of the various gases in a surrounding environment or area. It is used to detect the gas leakage and send the information to the controlling unit and to shut down the process automatically. A gas sensor is also capable of alarming to inform in which particular area the leakage is occurring.

This type of sensor is important because there are harmful gases which effect the living beings. Alcoholic concentration during breathing can be detected with the help of this sensor i.e. alcoholic (MQ3) sensor, because of its high sensitivity and fast response time. The sensitive material of MQ3 gas sensor has lower conducting capability in air

When gas sensor is exposed to the atmosphere the conductivity of the sensor goes higher along with rising gas concentration. This conductivity is connected to the output signal and with the help of this the gas concentration can detected.

#### *E. Ultrasonic Sensor*

This sensor is mainly used for obstacle detection. When an obstacle is detected, this sensor calculates the distance and does the predefined work as per the application requirement.

Ultrasonic sensors are normally used with the wave propagation duality principle. This sensor propagate at high frequency and one of the most advantage of using this sensors is that it can propagate through the vacuum space and also through any other media.

This sensor is mainly used for obstacle detection. When an obstacle is detected, this sensor calculated the distance and does the predefined work as per the application.

#### *F. GPS (Global Positioning System)*

It stands for Global Positioning System and this is normally used for automatic navigation purposes. The main use of GPS in this project is vehicular navigation. It is added with the controller part LPC1768 to emulate the regular vehicular activity. The controlling of the movement of the vehicle is done effectively with the help of GPS such that the tracking of activity of the vehicle can be easily detected. With the help of this accident location can be found out, and hence GPS is considered as an essential parameter of this project.

#### *G. GSM (Global System for Mobile communication)*

It stands for Global System for Mobile Communication which high lights the important fact about message exchanging between the different devices. The major use of GSM module in this project is to notify the people about the occurrence and the time when accident occurred. GSM is normally used for mobile telephony system.

Now a days due to the advancement of technology and due to the requirement of sophisticated communication we require super-fast network and to establish this GSM model has a primary role

#### *H. Motor*

The type of motor used in the project is the DC motor, which is an electro-mechanical machine which converts direct current into mechanical energy. Speed of the motor can be controlled with the help of the variable supply voltage or due to the changing current field in the windings.

#### *I. GLCD (Graphical LCD)*

Graphical LCD is used for displaying the information on it about the sensors operations as like dash boards.

### V. SOFTWARE USED

*KEIL*: Keil is a software development tool which supports microcontroller version, Dallas version and also the operations involved with different processors and also with embedded C platform. With the help of Keil the code generation can be done easily and also the interfacing with the hardware can be done smoothly with the help of run time environment present in Keil. It is such a sophisticated platform which contains different optimizing parameters like source code compilation part, project wizard window and build in facility, library function, documentation. With the help of this simulation and synthesis part becomes easier for the user to

make error free code generation and also to have a proper output. The operation which are being performed in the Keil environment are shown in the following wizard window.

## VI. LANGUAGE USED

*Embedded C:* This platform is a simple extension of the C language programming topology were we visualize the clear bit of study about the interface between the hardware and the software domain. Generally, compared to the simple architecture of c program Embedded C has its most wide range of application in this modern day scenario. As a programmer we need to know about the basic structure of c programming and with the help of this we can design any sort of code according to the user point of view.

Embedded C programming has its graph going on due to the presence of different optimizing parameters like main function, structural definition, data type declaration and syntax specifications. It has its extensive configuration specified due to the presence fixed point arithmetic and floating point arithmetic. With the help of this different manipulations involving mathematical calculations can be solved out, which is an important criteria in designing and implementation of code in the software domain.

## VII. PROPOSED SYSTEM

The proposed block diagram, as shown in the Fig1 is implementation of prototype model for accident avoidance system in automobiles. This system uses two LPC1768 controllers, one act as a master for monitoring all the operations going on in the system and other act as a slave part used for controlling the certain parameters involved in the project. Initially inputs are taken from the sensors i.e. ultrasonic sensor, vibration sensor and alcoholic sensor, the control flow is given to the Transmission Engine to turn off motor.

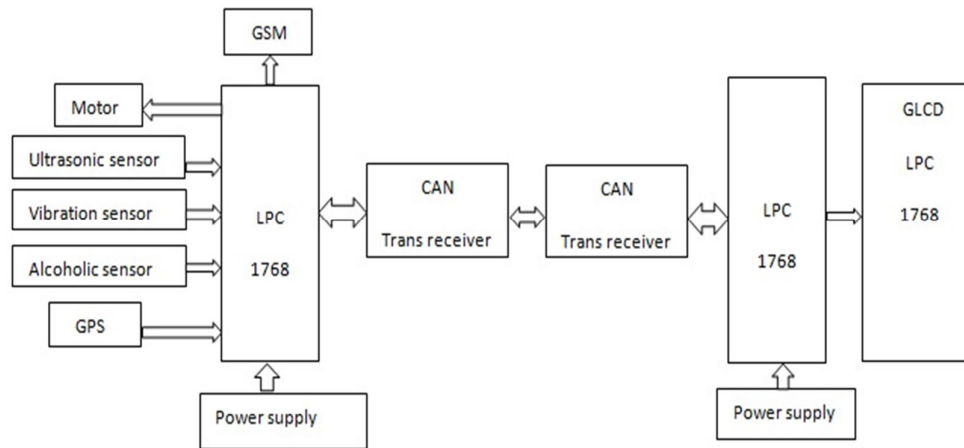


Fig 1. Proposed System

Suppose upon rear end collision of the vehicle due to accidents, vehicle senses the vibration which is being sensed by the vibration sensor and a location of the vehicle is being tracked and an information is sent to the predefined numbers with the help of GPS and GSM. All the changes occurred in the prototype model is being shown with the help of GLCD displays.

## VIII. RESULTS

Fig2 below shows the basic circuit being developed, were it make it use of various sensors for the accident avoidance. In the proposed system, as shown in the Fig3, LCD has display shows a information of a latitude and longitude of a vehicle i.e. ex: lat: 1258.51320,N and lon: 7732.27657,E. It also shows the detection of the alcohol by using alcoholic sensor (AS: DETECTED) and obstacle detected via ultrasonic sensor (US: DETECTED). As the alcohol and obstacle is detected, the vehicle stops moving. Fig4 shows the screen shot of the message being sent to the predefined number upon accident detected with the help of the vibration sensor.

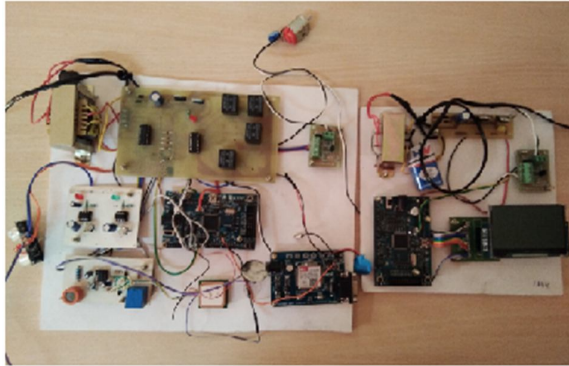


Fig 2. Basic Circuit



Fig 3. Sensor output

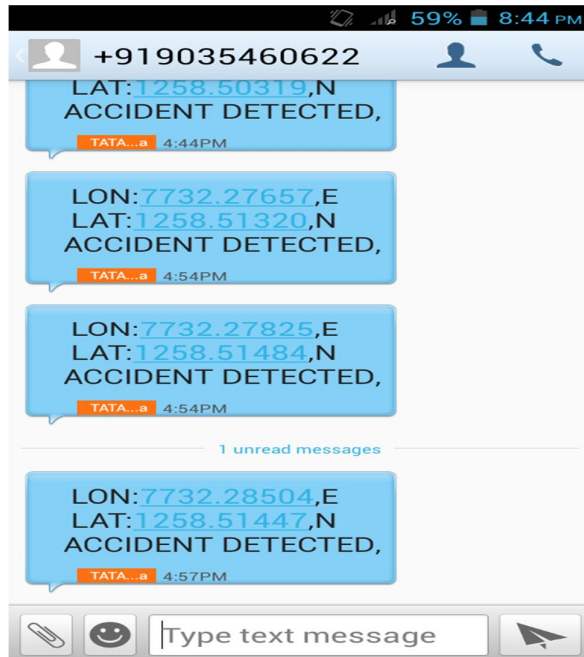


Fig 4. Accident Location of Vehicle being tracked

## IX. APPLICATION

- Safety provided for the pedestrians.
- High ended communication can be provided during the time of accident and also a message can be routed for a predefined network.
- Applied for obstacle detection.
- Reliability and high efficiency security are provided with the help of CAN protocol which is a basic parameter for the accident avoidance.

## X. CONCLUSION

The major objective of this paper is development of the accident avoidance system for automobiles using CAN protocol. CAN protocol was invented by Robert Bosch GmbH in 1983 to make automobiles smart and intelligent thereby making them more reliable, safe and fuel efficient. Various sensors are used to avoid the accidents, sensors such as vibration sensor, alcoholic sensor and ultrasonic sensor and GSM and GPS are used to send an information to the predefined numbers upon mechanical shocks to the vehicle on accident.

The design of this paper depends on high reliability and safety operations provided by CAN protocol to ensure high safety for the pedestrians and also to avoid frequent accidents phenomenon occurring in the road. By visualizing the experimental results the main task of this paper is achieved in providing high ended security. The overview of different sensors present physically on the board provide the experimental analysis of interfacing with that of the CAN protocol illustrates the major objective of the accident avoidance on the roadside. The future work of this paper is mainly dependent on the usage of the CAN protocol and also with the interfacing of this protocol with different sensors. This method is advantageous because it is low cost, reliable and high ended security can be provided. But the main question arises in the phenomenon of using this technique in a very smarter way. Now a days as a technology advances many techniques has come in existence replacing the older once to provided high efficiency according to the user point of view to avoid accidents. The technique which is being notified now a days is the IoT (Internet of Things). With the help of this Smart Road safety can be provided by giving high privilege to the error detection and the network safety. New road sensors have come into existence to help and have a diversion due to the flow of traffic from different areas when hazardous situation arises. IoT is used to provide stop gaps which is being used to for the rectification of different mistakes being done by the people at the time of driving.

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