

# AUTOMOTIVE SAFETY SYSTEM USING CONTROLLER AREA NETWORK(CAN) PROTOCOL

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**Abstract** - Driver and passenger safety is one of the prime concern in modern day vehicle. Automotive electronics is a rapidly expanding area with an increasing number of safety, driver assistance, and infotainment devices becoming standard in new vehicles. In existing system the main clogs are cost along with many things. For invulnerability four sensors are used. Temperature sensor is used to give the higher temperature notification on engine to retard faults about it. Light dependent sensor are useful for Glaring effect accidents by reason of opposite vehicle headlight illumination at night driving. Due to inaccurate pressure level monitoring in tyres, accident may occur so we prevent it through Air pressure sensors which will further enhance comfort and safety. Accident prevention sensor detects the obstacle in the path which help prevent accident. It is also useful in parking the vehicle which detects whether any vehicle are present close to the vehicle. The proposed system has three Master and Slave modules and are communicating through CAN (Controller Area Network). Sensors are interfaced to master and the slave. The proposed system is cost effective safety system, reliable and simple.

**Key Words:** (Adaptive headlights, Automatic dim/bright, Controller Area Network , Microcontroller, CAN trans-receiver , wheel pressure, Temperature, Accident prevention

## 1.INTRODUCTION

According to today's upcoming technologies, vehicle is one of the important necessity of human being. A vehicle dynamics, economy and comfort are improved by traditional electronic control but some problems come up which are very dangerous. Hence in-vehicle networking protocol gives benefits to many faults so we can inhibit problems such as the body wiring complexity, space constraints and some reliability issues. Therefore Alarming statistics of accidents and increased number of vehicles on road demands for an intelligent safety mechanism that helps the driver in handling immediate precarious situations. In this proposed system, there are five safety measures included. These safety measures are needed to avoid road accidents during day and night time. The Main motivation of this proposed system is to reduce recurrence of accidents.

CAN protocol is a serial communication message based protocol which uses a common bus to support the communication when required, all the station will receive the data but only the dedicated station will accept the data. MCP2551 is utilized for amplifying CAN which is an intermediately between the controller area network and the physical transport or sensors which conveys information. CAN IC is fit for the acknowledgment separating and for message administration with information rates up to 5 Mb/s and also helps to eliminate the number of ECU by few CAN-IC. The system comprises of combined instrument console between the user and automobile for observation, basic leadership and management. Interface for showing different parameters of automobile status like engine temperature, tire pressure and vehicle speed and so on. To enhance the user and automobile interface, an intelligent computerized framework is proposed that uses CAN protocol.

Controller area network (CAN) has been widely used for in-vehicle network. The demand of data rate of in-vehicle network has risen sharply, while traditional CAN communication cannot support this demand of data rate with limited bandwidth. CAN connects the ECUs (Electrical Control Units) embedded in the automobiles. To reduce night time driving accidents, higher temperature in an Automotive engine location, increased pressure on wheels, obstacles in path, vehicle parking issues are measures in the proposed system.

### 1.1 Objectives

- Design should be simple and reliable.
- To build safe and secure system in automobiles.
- To reduce wire complexity.
- To utilize CAN protocol to observe and monitor continuous automobile specifications.

## 2. LITERATURE REVIEW

Control Area Network protocol (CAN) was first invented by **Robert Bosch** a German in the 1980s. **Vikash Kumar Singh** designed implementation of 'CAN' protocol in automobiles using advance embedded system. In this paper control system with network Architecture have

benefit over the traditional method. Two sensors that is temperature sensor and IR sensor are monitor through two different microcontroller and CAN controller but these two can connected to the CAN bus. They also explain CAN protocol in brief with its format. CAN controller MCP2510 and CAN transceiver (MCP2551) are used as Transmitter and receiver respectively .They also explained the flow chat if transmitter section as well as receiver section. Fault confinement is also a major benefit of CAN. Faulty nodes are automatically dropped from the bus that prevents any single node from bringing a network down, and gives guarantee that bandwidth is always available for critical message transmission.

**Thanima Thulaseedharan** designed a real time intelligent driver assistance system in which ARM 7 microcontroller is used which monitor the vehicle in two parts as engine control and driver assistance. In engine control they had monitored temperature detector, CO level detector, Fire detector, fuel status and road surface nature .Simulation had done on the Keil µVision in which UART1 and UART2 give simulation results on engine control and driver assistance. A vehicle health report that enables to know about the current condition of vehicle so as to provide a safe drive.

### 3. PROPOSED SYSTEM

The point of this proposed prototype is to execute multiple applications using CAN protocol for various automobile applications. The multiple applications for this proposed system are accident warning system, tire pressure monitor, automatic headlamp dimmer and engine temperature monitor. Mcp2551 is used as the master and it is interfaced to Atmega 328 and each application is interfaced by the Atmega 328 and Mcp2551. Here Atmega 328 is a micro controller and Mcp2551 is a CAN transceiver chip.

The sensors are interfaced with the microcontroller and the microcontroller are interfaced to the CAN IC. Sensors keeps on providing the data every now and then to the microcontroller. All the CAN IC communicate with each other and selects the high priority messages or packets first and displays on the LCD. Here the accident avoidance system has the highest priority compared to other applications present in the prototype.

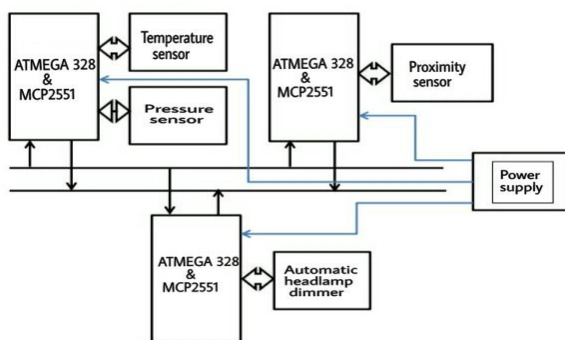


Fig. 3 Block diagram of model

### 3.1 Applications of Proposed Sensors

#### Temperature sensor:

It senses the change in engine temperature and displays according to the engine temperature. An external signal can be generated when the engine is overheated and temperature exceeds the maximum temperature so that driver can turn off the engine until the temperature value is reduced.

#### Air pressure sensors:

It is compulsory that the proper pressure is maintained in both front and back tires. Pressure sensor maintains the proper pressure and refill the air whenever it is necessary so that travelling will be more comfortable and safe.

#### Accident prevention(proximity)sensor:

It is used to detect obstacle in the path within the certain area so that the driver will be aware of the situation .It is also useful in parking the vehicles in which it will detect whether any other vehicles are present close to our vehicle.

#### Automatic head lamp dimmer:

Head lamp of the vehicle automatically changes the focus to low beam and how it reverses back to high beam. They are useful for glaring effect accidents by reason of opposite vehicle headlight illumination at night driving.

### 4. SOFTWARE TOOLS AND HARDWARE

#### Software tools used in this project:

- Proteus design suite version 8.0
- VSM simulator
- MikroC pro
- Mikropro programming suite

#### Hardware components :

- Micro controller(Atmega328)
- CAN Transciever(Mcp2551)
- Temperature sensor(LM 35)
- accident sensor(IR)
- pressure sensor(potentiometer)
- Automatic headlamp dimmer(LDR)

## 5. METHODOLOGY

The systematic approach followed during the project consists of following flow chart:

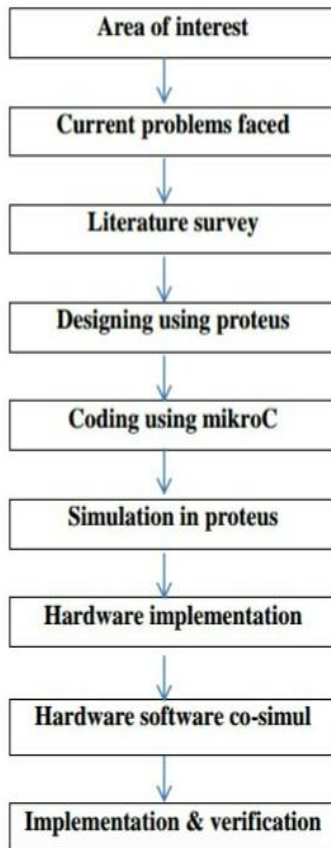


Fig. 5 Process Flowchart

## 6. ADVANTAGES

- Simple design and reliable.
- It will reduce accidents and hence enhances comfort and safety.
- It helps the driver in handling immediate precarious situations.
- System is capable of detecting error.
- Systems can transmit signals simultaneously.
- Additional microprocessors and sensors could be added to the existing system.
- Improves vehicle functionality, performance and comfort.
- Fast and efficient communication due to less use of processors and wiring.

## 7. CONCLUSION

Accidents are a major cause of death and disability. There's one death every four minute in India due to road accident. To enhance the user and automobile interface, an intelligent computerized framework is proposed that uses CAN protocol. We can also prevent accidents occurred during night time. The LCD given at the driver's board shows the different alerts produced with various sensors. Multiple sensors identify the changes nearby displays on the screen. We can monitor approximately 120 parameters through CAN. We can also use GSM module to alert vehicle proprietor by SMS.

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