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ACCIDENT AVOIDANCE SYSTEM USING CAN

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Abstract - *Controlled Area Network (CAN) architecture has been implemented to avoid accidents that are happening around the world. The benefits of CAN based bus network over other communication protocols will offer increased flexibility for future technology insertions.*

This project describes a system which uses multiple sensors to sense various parameters like speed of the car, distance from other car, surrounding temperature, presence of alcohol if driver appears to be drunk, external pressure and sends the alert signal with the display on the LCD if any parameter goes out of zero as to avoid accidents.

***Key Words*: CAN, Speed, Alcohol, Temperature, Pressure**

1. INTRODUCTION

The current automation is growing rapidly. Automated systems gains attention in the market. All the car companies look to implement some automated system to make their car attractive. These can't be afforded by everyone. Also most of the economical cars today will have no accident avoidance system in them. So a system has to be developed which is cost effective and well automated. Accident avoidance system could even be a system of sensors that's placed within a car to warn its driver of any dangers which is in a position to lie ahead on the road. A spread of the risks that these sensors can develop on includes how close the car is to other cars surrounding it. The sensors will detect that car and inform the person, preventing him from potentially moving into a vital accident. Ultrasonic sensor is customized to live a spot with relevance the previous car. For this subsystem, the currently available ultrasonic sensors are adopted to make sure that the distance is maintained well and based on the readout of the sensor appropriate warning signals are provided. We also include the alcoholic sensors in it to seem at the person driving the car. If the person appears to be drunk the transmission are automatically converted. If accident occurs then MEMS sensor detects accident and immediately sends SMS to the concerned person about location of accident. If the encircling temperature goes beyond a specific limit temperature sensor is implemented to check the encompassioning temperature.

2. PROPOSED SYSTEM

The proposed block diagram for CAN bus communication system is as shown in figure 3. In this system the ultrasonic sensor is mounted on the front and backside of the car for measuring the distance between the two cars and if the distance is less then to avoid accident warning signal will be given to the driver on the LCD. The alcoholic sensor will sense whether the driver is drunk and if the driver is drunk then the driver will not be allowed to start the car. If the car accidently changes its lane then it will be detected using an IR sensor and buzzer will be turned on. The speed sensor will monitor the speed of the car and if found high then warning will be given to the driver using an alarm. Here the sensors will communicate with the output devices using CAN (Control Area Network) protocol which will be implemented in the AVR controller.

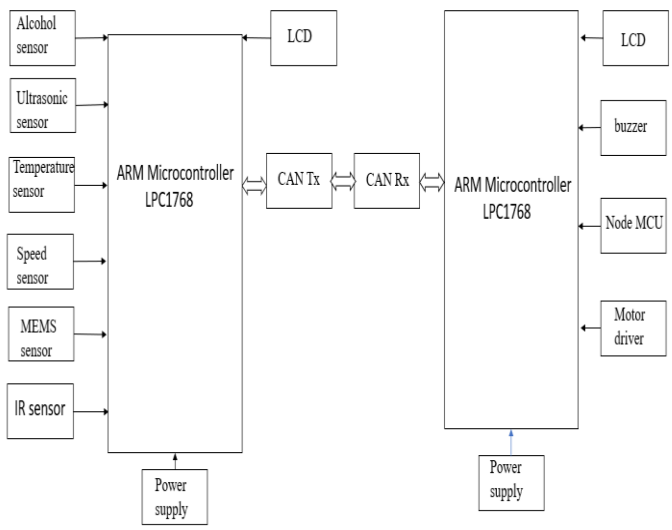

Fig-1: Block Diagram

2.1 Methodology

There are two controllers named master and slave.

Master is responsible for each and every action performed in the system.

Master has the higher priority over slave.

Master tells slave what has to be done, and take action over slave performance.

Slave takes all commands from master and monitors the sensor value continuously.

Finally master monitors all the operation of the system.

The overall action will be continuously displayed on the display system.

Ultrasonic sensor is customized to live a spot with relevance the previous car. For this subsystem, the currently available ultrasonic sensors are adopted to make sure that the distance is maintained well and based on the readout of the sensor appropriate warning signals are provided. We also include the alcoholic sensors in it to seem at the person driving the car, if the person appears to be drunk the transmission is automatically converted. If accident occurs then MEMS sensor detects accident and immediately sends SMS to the concerned person about location of accident. If the encircling temperature goes beyond a specific limit temperature sensor is implemented to check the compassioning temperature.IR sensor detects if there is any motion around the car and detects the message to the driver through the LCD and the speed sensor to detect the over speed of the vehicle

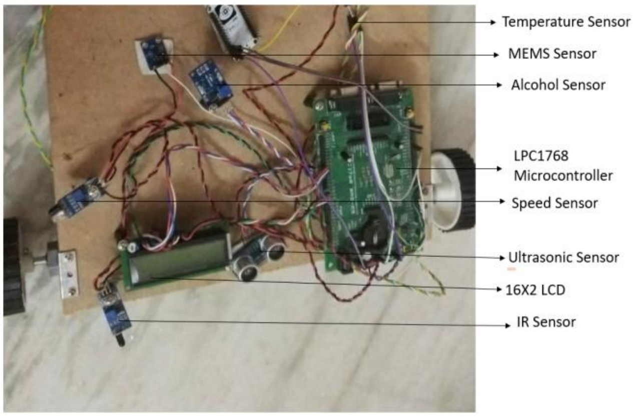

Fig-2: Tx Part

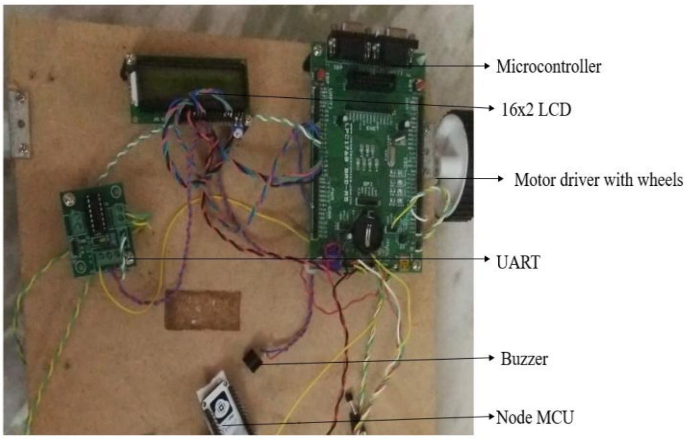

Fig-3: Rx part

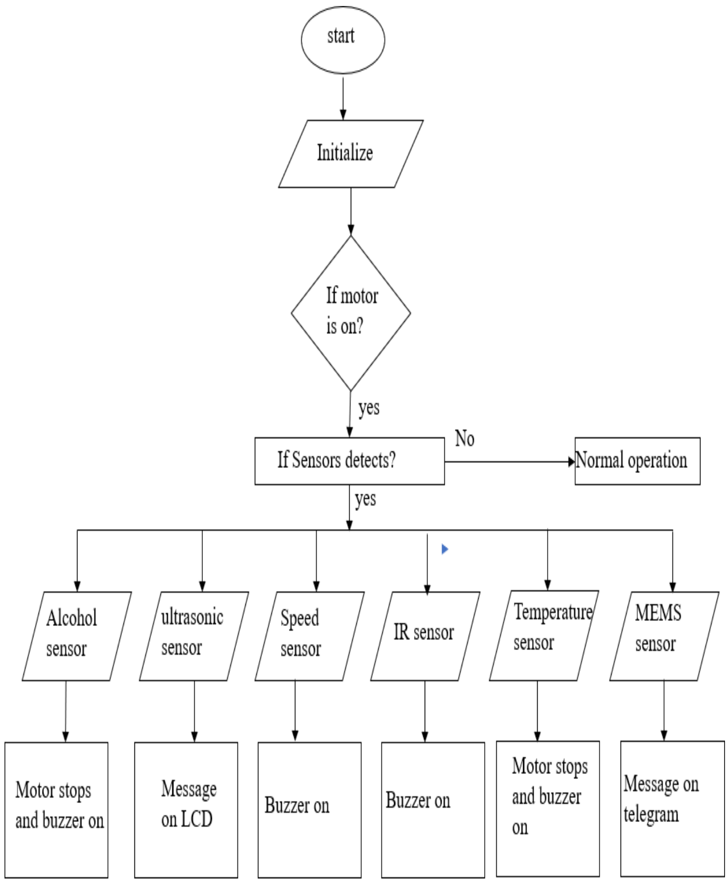

Fig-4: Flow chart

3. HARDWARE REQUIREMENTS

3.1 Ultrasonic sensor HCSR-04

Ultrasonic sensor is adapted to measure the distance with respect to the previous car. While the car is in motion the distance of another car is measured and accordingly warning signals are given to the driver.

Supply voltage 5v Global Current Consumption 15 mA.

Ultrasonic Frequency 40 kHz.

Trigger Pulse Width 10 µs.

Outline Dimension 43x20x15 mm.

Operating voltage: 3V to 5V.

Temperature Range: -55°C to +125°C.

Accuracy: ±0.5°C.

3.2 Alcohol sensor MQ3

An alcohol sensor detects the attentiveness of alcohol gas in the air and an analog voltage is an output reading .The sensor can activate at temperatures ranging from -10 to 50° C with a power supply is less than 150 Ma to 5V.The sensing range is from 0.04 mg/L to 4 mg/L, which is suitable for breathalyzers.

3.3 IR sensor TSOP03

IR sensor will detect whether the car is in the same lane it is travelling and if accidently the car changes its lane then accordingly a warning will be given to the driver.

5 VDC Operating voltages.

I/O pins are 5V and 3.3V.

Compliant Range: Up to 5m and 20mA supply current.

Fig-5: Ultrasonic sensor

Fig-6: Alcohol sensor

Fig-7: IR sensor

3.4 Temperature sensor LM35

The temperature sensors continuously monitor the temperature of the engine and if the temperature of the engine goes beyond a particular value warning signal is given to the driver.

Operating voltage: 3V to 5V.

Temperature Range: -55°C to +125°C.

Accuracy: ±0.5°C.

Fig-8: Temperature sensor

3.5 Motor driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge

Fig-9: Motor driver

Motor Driver integrated circuit (IC).

Supplies a max current of 600mA and drives motors up to 36v.

The maximum voltage ranges from 5v and up to 36v.

3.6 Microcontroller

The controller will take input from the sensors and depending on the various sensor inputs output devices will be driven using the other microcontroller. The controller LPC 1768 has inbuilt CAN controller .The two microcontroller will communicate with one another using can communication protocol. LPC 1768 is a Cortex M-3 controller for embedded applications featuring a high level of integration and low power consumption. The ARM Cortex-M3 is a next generation core that offers system enhancements such as enhanced debug features and a higher level of support block integration.

Fig-10: Microcontroller

3.7 MEMS sensor

MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that it responds to the pressure which is measured pressure with the help of some mechanical actions.

Fig-11: MEMS sensor

3.8 CAN Transceiver MCP2515

It adapts signal level from the bus to level that the CAN controller expects and has protective circuitry that protects the CAN controller. It converts the transmit-bit signal received from the CAN controller into a signal that is sent onto the bus.

Supports CAN V2.0B specification, with communication speed up to 1Mb/s.

0 to 8-byte data field with standard frame, extended frame and remote frame.

Fig-12: CAN Transceiver

3.9 Speed sensor

Fig-13: Speed sensor

This sensor monitors the speed of the car and if the speed is found to be more than a prescribed level then a warning signal will be given to the driver.

Operating voltage of 3.3 V to 5 V.

3.10 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

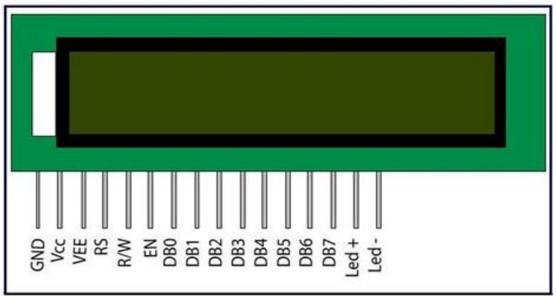

Fig-14: LCD Display

3.11 Node MCU

Since Node MCU is open source platform, their hardware design is open for edit/modify/build. Node MCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wifi chip developed by Express if Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266_WiFi_Module. There is Version2 (V2) available for Node MCU Dev Kit.

Fig-15: Node MCU

3.12 Buzzer

A buzzer is an electromechanical, or piezoelectric (piezo for short) audio signaling device. Typical uses of buzzers and beepers include alarm_devices, timers, and confirmation of user input such as a mouse click or keystroke.

Fig-16: Buzzer

4. EXPERIMENTAL RESULTS

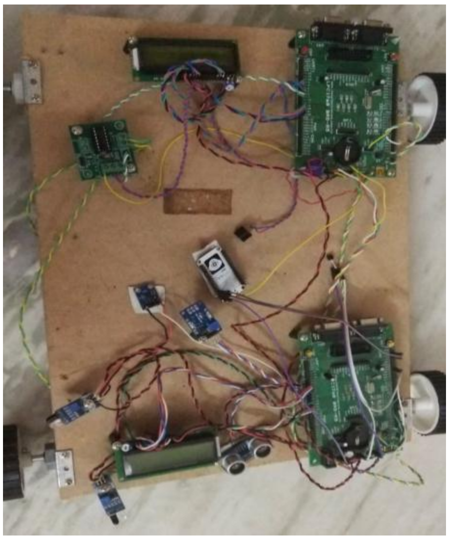

Fig-17: Proposed system

We were successful in implementing the proposed system which is shown in the figure 17.

The sensors, motor, LED, LCD and buzzer are successfully integrated to LPC1768 microcontroller along with CAN. We are able to continuously get the input from sensors and act accordingly based on input and threshold, like

Displaying temperature conditions, over speed, Object detection, inclination angle, alcohol detection and distance between vehicle and obstacle on LCD.

Trigger the buzzer and the motor when input exceeds the threshold.

Exchanging the messages between the Tx and the Rx with the help of CAN.

Fig-18: Alcohol sensor with its o/p

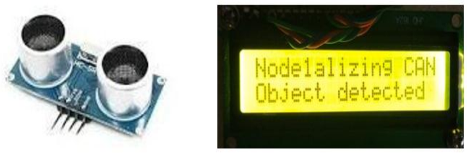

Fig-19: Ultrasonic sensor with its o/p

Fig-20: Temp sensor with its o/p

Fig-21: IR sensor with its o/p

Fig-22: Speed sensor with its o/p

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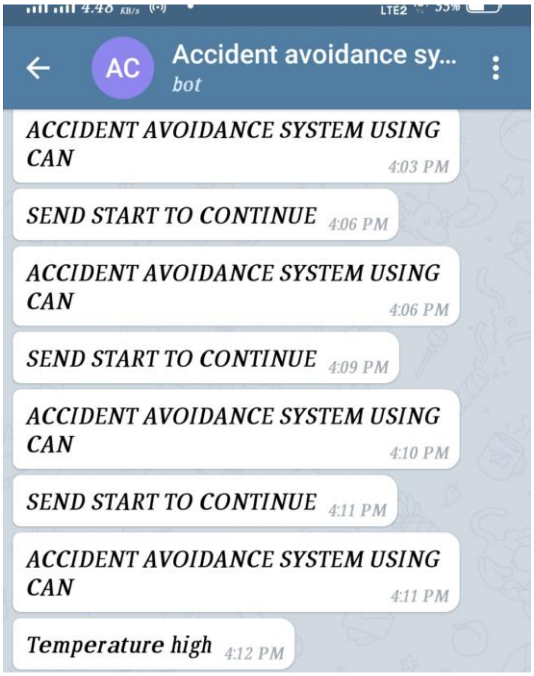

Fig-23: Initialization on the Telegram app

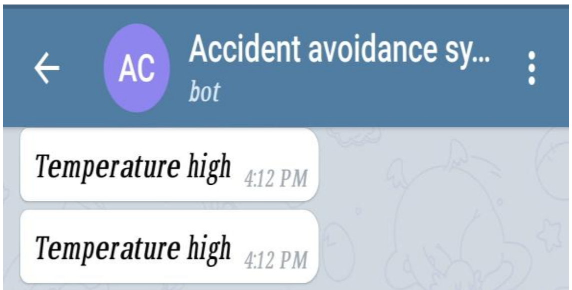

Fig-24: O/p of temp sensor on the app

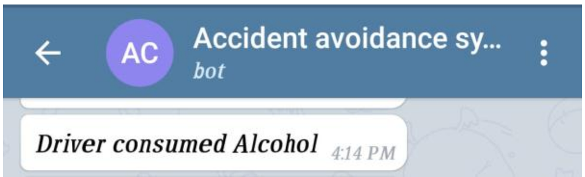

Fig-25: O/p of alcohol sensor on the app

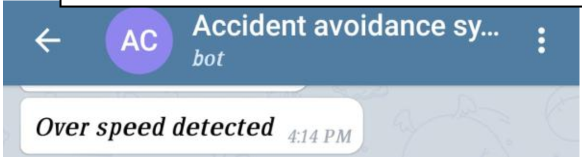

Fig-26: O/p of speed sensor on the app

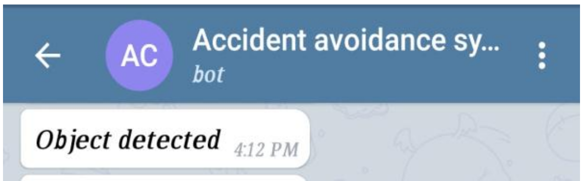

Fig-27: O/p of Ultrasonic sensor on the app

5.CONCLUSIONS

The major objective of this is to the development of the accident avoidance system for automobiles using CAN protocol.

Various sensors are used to avoid the accidents, sensors such as Mems sensor; alcoholic sensor and ultrasonic sensor and Node MCU are used to send information to the predefined numbers upon mechanical shocks to the vehicle on accident. The design of this work 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 is to achieve in providing high ended security.

The overview of different sensors presents 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.

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