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Automotive control system using CAN protocol

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ABSTRACT

Most of the accidents occur because of alcoholic people and the failure of braking systems. So this paper describes a driver's alcohol detection system based on breath sample testing and automatic control of the braking system to avoid accidents. When driver starts the ignition system, the sensor measures the concentration of alcohol into its breath and switches off the ignition system. This system is also able to control the accidents that occur due to the unconsciousness of the driver, uncontrollable speed of the vehicle, and manual operation of the braking system by applying automatic breakthrough electronics devices to minimize the accident problems. When the vehicle gets closer to any object, automatically brakes will be applied. This system helps in achieving effective communication between transmitter and receiver modules using the CAN protocol. The protocol was developed aiming at automotive application switch sensors to monitor the parameters and visualize them to the vehicle driver through an LCD display. The human drivers check the parameters in the vehicle on the LCD screen at the same time of driving and control over the vehicle.

Keywords: *CAN, Alcohol Sensor, IRSensor, Intelligent Braking System, LCD Display*

1. INTRODUCTION

Nowadays, the consumption of alcohol is a common habit in many cultures, associated with traditions, festivities and other personal events. But even a small quantity of alcohol will affect human behavior. It is a common cause of car crashes involving human error as well as unconsciousness of driver, uncontrollable speed of the vehicle and manual operation of braking systems are the reasons of accidents. So we have installed a MQ-3 sensor on the steering of the car that detects the concentration of alcohol into the breath of the drunk driver. When driver start the ignition system, sensor measures the concentration of alcohol in to its breath and switch off the ignition system. For operation of braking systems it is necessary to control brakes automatically through electronics devices to minimize the accident problems. In this research paper we propose an effective methodology for automatic control of braking system to avoid accidents. In this technology we used Arduino, relays, IR transmitter and IR receiver for effective function of braking control system. This complete system can be fitted on to dashboard of a vehicle and effectively used for automatic control of braking system. So we can minimize such types of alcohol and uncontrollable speed related accidents. In this way it is going to be used in vast applications. This type of system is a great safety factor.

For efficient communication among IR sensor and MQ-3 sensor, PIC16F877A controllers, LCD display and relay and other nodes in real-time applications, we used CAN (Controller Area Network) protocol. It is known for its simplicity, reliability, and high performance. It has given an effective way by which can increase the car and driver safety. This paper presents the development and implementation of a digital driving system for a semi-autonomous vehicle to improve the driver-vehicle interface. It uses a PIC based data acquisition system that uses ADC to bring all control data from analogue to digital format and visualize through LCD.

2. SYSTEM BLOCK DIAGRAM

In this block diagram there are two sensors - IR sensor and alcohol sensor. This system helps in achieving effective communication between transmitter and receiver modules using CAN protocol. Power supply gives to the PIC microcontroller and every sensor as per the requirement. To monitor the parameters and visualize them to the vehicle driver through a LCD display.

In figure 1 these sensors are interface with the PIC16F877A microcontroller and data transfer through the CAN bus. These sensors continuously sense the information and send the information to the microcontroller. This system consists of two nodes; one is master node and second is monitor. Master controller controls the vehicle status with various sensors. If any object comes

near to vehicle IR sensor sense it and automatically break apply. Alcohol sensor fix on steering of the vehicle, before driver is begin to start the vehicle first he sense it if driver is not drunk vehicle start and if drunk it will not start and that data will on the LCD screen. Using CAN controller does the communication between these sensors. Braking motors are included to activate the brakes thereby attaining automatic braking procedures. The system helps in coincidence with the driver judgment if the driver doesn't sense the obstacle and applies the brake at the right time then the microcontroller initiates braking motor to reduce speed automatically. Aware of safety in terms of avoiding accidents in the first place and then protecting occupants when a crash is unavoidable, we can avoid more accidents, save more lives, and reduce insurance and medical costs to society. Automotive vehicle control System approach provides a significant shift from the traditional approach to safety, but it is necessary to achieve the substantial benefits.

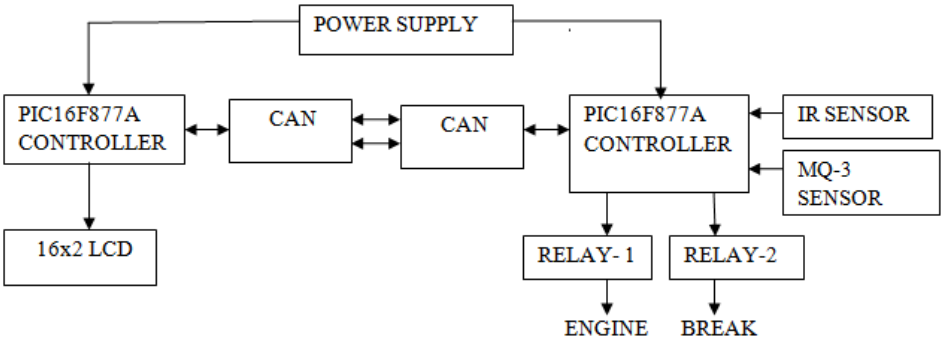

Fig. 1: Block Diagram of Process

3. HARDWARE STRUCTURE

It is designed to be low-cost and simple, but sufficiently accurate to provide useful BAC measurements. The system hardware consists of components, which are: PIC 16F877A controllers, transducer, alcohol sensor, IR sensor, LCD display and relay, motor. The software part includes a GUI application developed in Lab view graphical programming environment, ACCL, NI-VISA Drivers and Arduino IDE. Alcohol and temperature sensor readings are acquired by means of an Arduino Uno board through the Analog to-Digital Converter (ADC) of board.

3.1 PIC16F877A Controller

Microcontroller is used to operate and control the whole circuit. Here, we used PIC 16F877A controllers. This microcontroller is very convenient to use.

3.2 CAN

This system helps in achieving effective communication between transmitter and receiver modules using CAN. It has efficient data transfer and also takes feedback of vehicle conditions.

3.3 MQ-3 Alcohol Sensor

The MQ-3 alcohol sensor is used to detect the alcohol concentration from breath sample. When the alcohol concentration exceed a specified threshold, the relay is turned on and the engine ignition system is disabled.

3.4 IR Proximity Sensor

When the vehicle gets closer to any object, automatically brakes will be applied. This Sensor works by detecting reflected light coming from its own infrared LED.

3.5 LCD Display

The 16x2 LCD with multiple sensors to monitor the various parameters and visualize them to the vehicle driver through a LCD display and alarm.

4. WORKING MODEL CIRCUITS

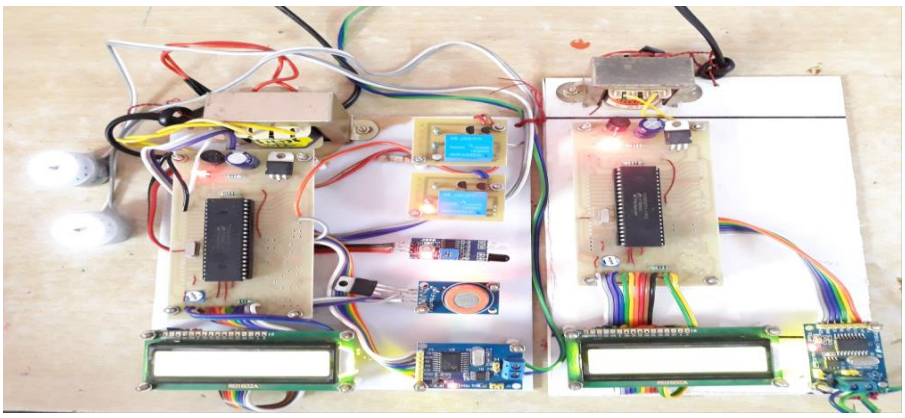

Fig. 2: Implemented Hardware

Figure 2 Sensor measures no concentration of alcohol in to its breath and no object near the vehicle motor is running in which one motor is use in the hardware as a engine and other is break.

This system helps in achieving effective communication between transmitter and receiver modules using CAN protocol. The protocol was developed aiming at automotive application switch sensors to monitor the parameters and visualize them to the vehicle driver through a LCD display. The human drivers check the parameters in vehicle on LCD screen at the same time of driving and control over the vehicle.

5. RESULTS

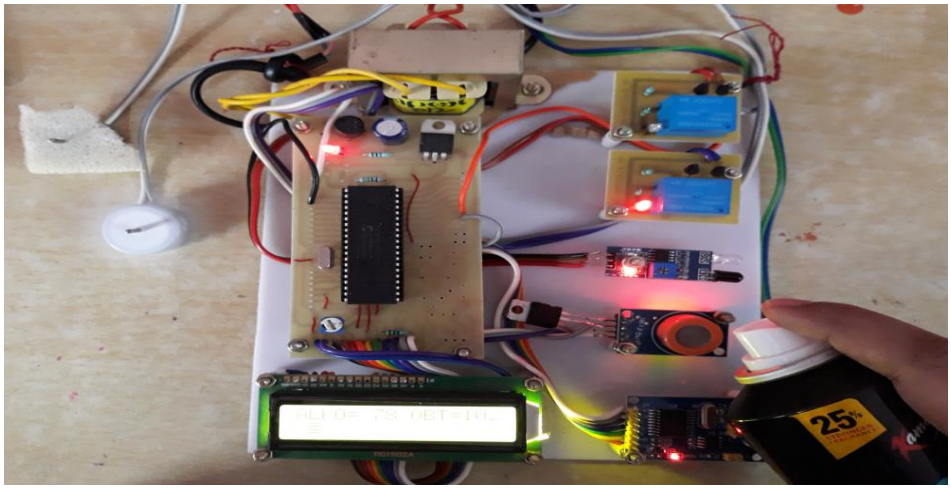

Fig. 3: Alcohol sensed by the sensor

Fig. 3.1: Reading on LCD of alcohol sensor

In Fig.3 When MQ-3 sensor measures concentration of alcohol vehicle is not start in the hardware one motor is use as a engine and other is break. Fig 3.1 consist that the concentration of alcohol is 58mg/L present in air.

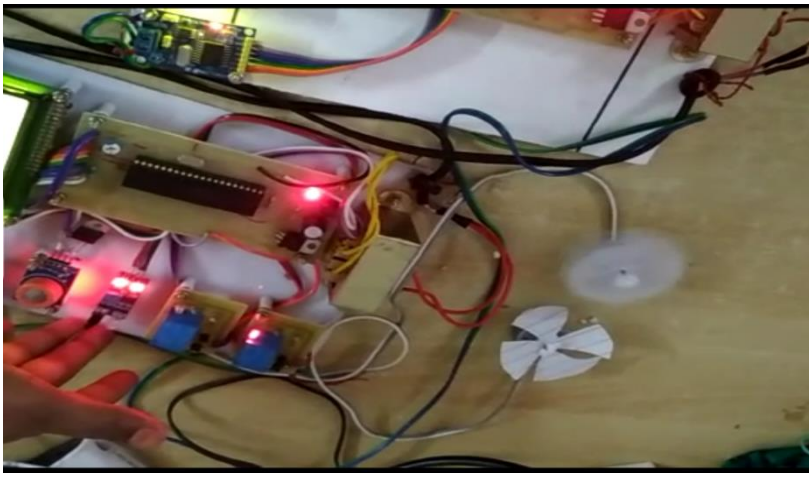

Fig. 4: Automatically Break Apply when obstacle comes near to vehicle.

Fig. 4.1: Reading on LCD of IR sensor

Fig. 4 When obstacle comes near to the IR sensor motor is stop to run it means that if obstacle comes near to vehicle automatically break will apply and vehicle get stop. Fig.4.1 consist of reading of IR sensor that vehicle is only 15cm away from obstacle.

6. CONCLUSION

This paper describes about design and development of automobile control system using CAN protocol which will not only make driving simpler but also increase vehicle safety and security. CAN bus system solves the problem of automotive system applications with PIC as the main controller and it makes full use of the high-performance of PIC16F877Amicrocontroller, high-speed reduction of CAN bus communication control networks and instrument control so as to achieve full sharing of data between nodes and enhance their collaborative work.

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