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A Literature Review on Collision Avoidance in Vehicles using CAN

Priyanka M G[1], Vinod B Durdi[2]
[1, 2]*Department of TCE, Dayananda Sagar College of Engineering, Bangalore, India*

Abstract: ***Technological advances for a great vehicle experience safety system is very important in automobiles. Accidents can occur anytime, anywhere, so you need to discover and save lives before an accident occurs. Traffic accidents are increasing day by day, and emergency facilities are not well equipped, resulting in significant loss of human life and property. Technological advances to make cars more interactive and intelligent to avoid road accidents. This paper states as an extension of the safety system, a system based on multi-sensor control area network (CAN) is connected to the engine control unit (ECU) via an ARM7 microcontroller. To prevent accidents, we use a variety of sensors to monitor driver fatigue, alcohol levels, obstacle detection, brake detection, and sudden collisions. GSM and CAN technologies accelerate communications, significantly improve system reliability, safety and stability, and achieve the expected results of real-time data analysis very effectively, a safer ride is guaranteed.***

Keywords: Automobiles, Control Area Network (CAN), Engine Control Unit (ECU), ARM7 microcontroller, GSM.

I. INTRODUCTION

Accidents increase rapidly as the number of vehicles on the road increases daily. However, due to the Automotive Safety Act and new technologies in the automotive sector, the number of casualties associated with these accidents is decreasing. Some accidents are caused due to false estimates of distance from nearby vehicles. Accidents happen when vehicles are very close to each other while the driver is fallen asleep or when the vehicle is unaware that they are very close. According to the Global Road Safety Partnership (GRSP) 2014 Annual Report, approximately 1.24 million people worldwide die each year in road accidents. Approximately 70% of traffic accidents [7][8] occur because the driver does not keep sufficient distance between the moving vehicles. These can occur during traffic or when driving at high speeds. Other reasons include drivers passing by at different speeds, the car braking not working, or a signal display error. Therefore, new collision avoidance measures need to be developed to avoid collisions of all types of vehicles. This document proposes an intelligent vehicle collision avoidance [1] and safety system. The method presented here uses an ultrasonic sensor [1] which detects that the vehicle is approaching your vehicle and alerts the driver. The driver is also alerted by LED light which glows red when an obstacle is near and displayed on LCD. Brake detection, alcohol detection and driver fatigue level are implemented and are alerted through red LED light and displayed on LCD.

II. REVIEW ON VEHICLE COLLISION AND ACCIDENT AVOIDANCE

The following literature survey is carried out with reference to vehicle collision and accident avoidance:

A. Adnan M. Al-Smadi, et al. [1].

This paper proposes a design for detecting an imminent collision and works to prevent or reduce the strength of the imminent collision at the rear or front of the vehicle. The method presented here uses an ultrasonic sensor. Detects that the driver is approaching his vehicle and displays an alert to the driver. This system measures the distance between two vehicles moving in the same lane and in the same direction. If the trajectory of an object is directed at your vehicle and becomes dangerous, the system will deploy security measures to your vehicle.

B. Mahesh A. Rakhonde, et al. [2].

This document is based on improvements to the intelligent vehicle system. This document implements various units that improve the vehicle system. The main goal is to detect accidents in real time and minimize medical support response times. Tire pressure is measured to avoid accidents and accident detection is implemented using MCU nodes. MQ7 is used to monitor pollution. The proposed system helps reduce vehicle accidents, and monitoring pollution helps to know the state of the environment.

C. P. Ramya, et al. [3].

The purpose of the project is to provide a technical approach to detect and monitor driver fatigue levels to avoid accidents early. Is to do. The purpose is to detect if the driver is drunk. This locks the vehicle's ignition system. This system controls the direction of the vehicle when the limit distance is exceeded and avoids accidents. We also send information to relevant authorities or owners in the event of an accident caused by the use of the GSM module. From observations, we can conclude that there are three main causes of road accidents: sleep, overtaking, and drinking, which are related to the driver. One of the main reasons for drunk driving is that not all police officers can check every car to determine if a person is drinking. Therefore, there is a need for an effective system for screening drunk drivers with alcohol detectors. By connecting the Raspberry Pi and the ultrasonic sensor, it is possible to detect the forward movement of the vehicle and control the vehicle at a very high speed, or turn left and right according to the vehicle in another lane to control the direction of the vehicle. In the event of an unavoidable accident, an SMS will be sent to the relevant authorities or the owner of the vehicle.

D. Aditi Padayar, et al. [4].

The main goal of this project is to develop a system for determining alcohol content. The driver's air exhales and automatically turns off the car when the alcohol concentration exceeds the limit. This project uses the 8051 family (89s52) microcontrollers.MQ3 is used as an alcohol sensor in this project, which aims in alcohol content detection in human breathing. The alcohol sensor outputs analog data that cannot be analyzed by the 8051 micro-controller. The data received from the alcohol sensor is converted to digital format by a digital converter (analog-to-digital converter). The data is then stored in the microcontroller and compared to the threshold. If the value exceeds the set limit, the program controller will take appropriate action to control the ignition system. Here, an electromechanical relay was used to control the ignition system. In this project, by controlling the ignition system, it is possible to prevent accidents caused by drunk driving and driving.

E. Mubashir Murshed, et al. [5].

Car Accident is considered one of the most devastating phenomena. There are many reasons for a traffic accident, but most accidents are caused by the driver's carelessness and uncontrolled speed. There also seems to be a problem in getting to the scene of the accident in time due to lack of awareness. As a solution, the advent of Internet of Things (IoT) technology can reduce the number of accidents. This article describes an intelligent system that alerts and controls the speed of the vehicle and notifies people accordingly in the event of an accident. The system uses distance sensors to constantly monitor the distance between the vehicle and obstacles in front of it. It controls speed and warns the driver to slow down when the critical distance is reached. Whenever a dangerous accident occurs, an email notification with vehicle details will be sent to the responsible person.

F. Rachia Shettar, et al. [6].

This paper describes three basic circuits for accident prevention and control measures. To do. One is the accelerometer circuit used to detect drowsiness, and the other is the alcohol sensor circuit used to detect and control the vehicle due to alcohol consumption. When a single-step accelerometer detects and captures tilting motion, an alarm mechanism controlled by a relay can prevent accidents due to drowsiness. Similarly, when the alcohol level is read by a higher than the normal sensor, the relay turns off the vehicle's ignition process. In addition to detecting this brake failure, continuity is also checked if the vehicle owner has not been warned to prevent a brake failure accident.

III. COMPARISION ON TECHNOLOGIES OF VARIOUS PAPERS USED TO AVOID COLLISION IN VEHICLES

The analysis of different technologies of various papers is compared out in Table 3.1.

Table 3.1

Authors	Title	Remark
Adnan M. Al-Smadi, Wasan Al-Ksasbeh, Mohammad Ababneh, Manar Al-Nsairat (IEEE, 2020). [1]	"Intelligent Automobile Collision Avoidance and Safety System".	In this article collision avoidance in rear and front of vehicles is only detected using ultrasonic sensor. Obstacle detection or collision avoidance is not the only reason for accidents occurrence.

Mahesh A. Rakhonde; Prof. Dr. S. A. Khoje; Prof. R. D. Komati (IEEE, 2018). [2]	” Vehicle Collision Detection and Avoidance with Pollution Monitoring System Using IoT”.	In this document pollution detection is done using MQ7 and accident detection which is not the only parameters affecting the road safety, hence further implementation has to be done like driver fatigue level, obstacle detection through LED lights and displays alert message through display.
P. Ramya, R.K. Kavi n, R. Rathish, M. Sathees Kumar, R. Karthi Kumar (IJESC, 2020). [3]	“Accident Avoidance and Prevention System”.	In this article, only alcohol detection and ultrasonic sensors are implemented on the Raspberry Pi, which slows down communication between vehicles a bit, which could lead to an accident.
Aditi Padayar, Dipali Jadhav, Priti Pashte, Shweta Lagade, Prof. S. K. Srivastava (JETIR, FEB 2020). [4]	“Microcontroller-based Accident Prevention System Using IOT”.	This paper prevents IoT accidents, which are still slow communication for drivers. Alcohol detection is the only parameter implemented in this paper.
Mubashir Murshed, Md Sanaullah Chowdhury (ICATIS, 2019)	“IoT-based Car Accident Prevention and Detection System with Smart Brake Control”.	In this paper, the brake detection parameters are implemented using IoT. As you know, the IoT deals with the Internet. Slow internet speeds can delay email notifications and vehicle details, leading to accidents.

III. CONCLUSION

In this work, a sensor- based collision avoidance system has been proposed. The design is developed using a wireless system. These systems are designed, implemented and tested for vehicle safety. To improve performance, you need to do a lot of work, including power consumption, sensor detection speed. The results ana analysis of this hands-on experiment show expected performance and ensure the safety of drivers and pedestrians, other vehicles, health surveillance and other obstacles. It supports low-cost systems and provides a fairly flexible and compact single Soc. This design offers more future options for creating security systems more sophisticated and efficient.

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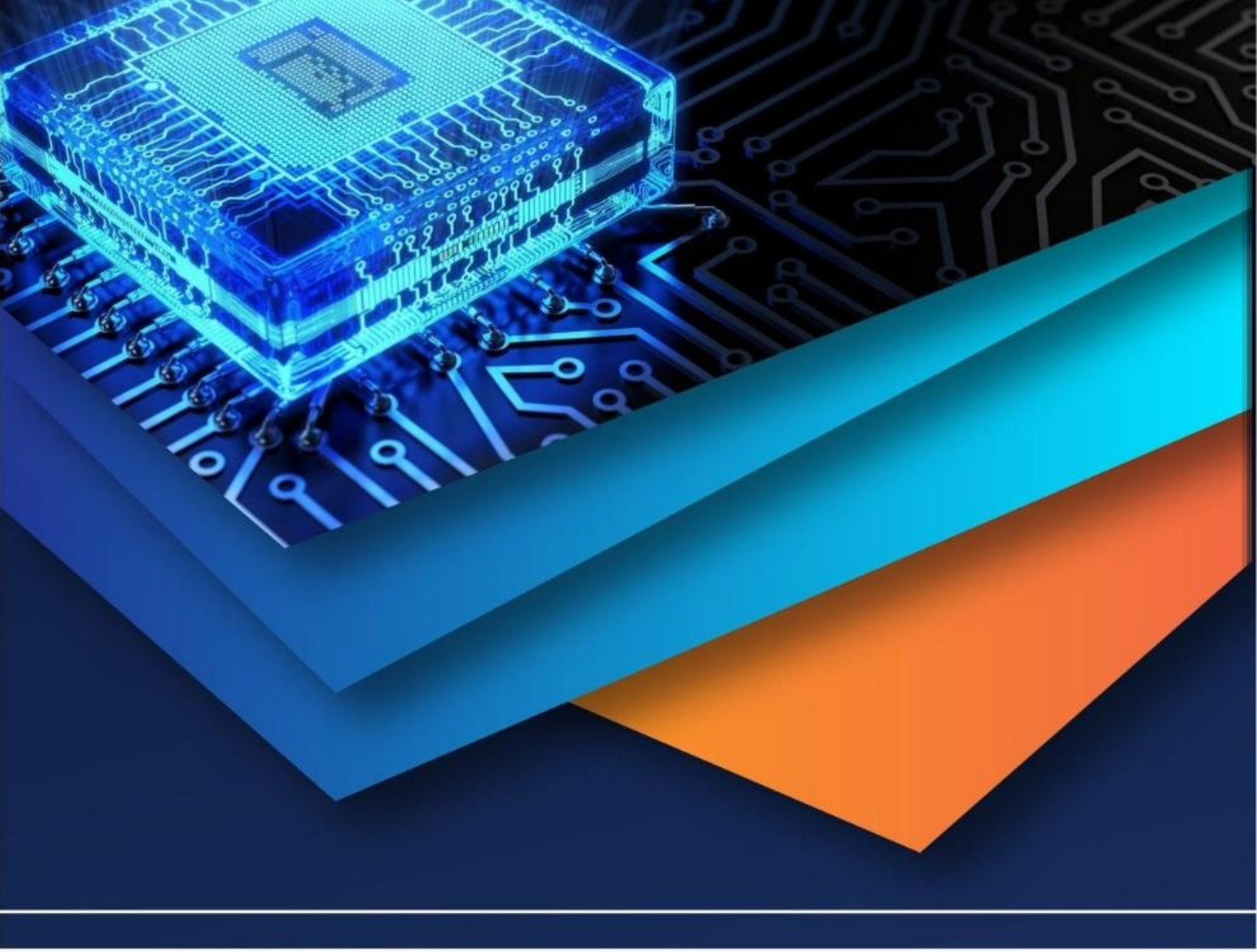

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