



Vehicle Speed Control System using CAN

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ABSTRACT

The objective of this project is to develop a Speed Control System with onboard sensors and microcontroller. In this paper, the CAN-bus based communication system for vehicle speed control system and GSM based antitheft system is designed. The system can be upgraded easily and use of CAN reduces wiring. Also, the use of ARM 7 ensures fast operation, high efficiency, low cost, low power and higher performance. This is the Main Controller of the system and the algorithm runs on this controller is based on the information received by the sensors. It uses radar which is mounted in front of the vehicle to scan the front environment and it will trigger a signal to the main controller. The speed of the vehicle will be controlled by the servo motor when an obstacle is detected. Also when an unauthorized person starts the car, then the anti-theft system becomes active and gives indication by sending a SMS through GSM that the car is being stolen.

Keywords: Anti theft system, CAN communication, Speed control system.

I.INTRODUCTION:

To reduce the number of road accidents, speed control system is designed. The system uses sensor to detect an imminent crash. When detection occurs, the system takes action autonomously without any driver input. Generally cars on the same direction in highway keep a safe distance one another with a similar speed. On the other hand, due to prolonged periods of continuous driving, the driver's distraction, or even a sudden deceleration of the previous car, a serious clash may occur if the driver can not react in time to brake. Therefore developing a front-obstacle warning system is important in collision avoidance. For the speed control system, radar sensor is adopted to measure the distance with respect to the previous car or the obstacle [2]. In this paper, advanced ideas such as pre-crash sensing, radar is used to sense the object in front of the vehicle and gives the signal to the microcontroller unit. Based on the signal received from the sensor, the micro controller unit sends a signal to the servomotor to reduce the speed of the particular vehicle by changing the position of throttle valve. Also it sends a signal to the braking unit for applying the brake automatically. That is to avoid the crash during the period of vehicle's running condition, the system automatically applying the brake. Also when an unauthorized person try to steal a vehicle then the system gives warning by sending SMS to the authorized user through GSM.

The rest of the paper is organized as follows. Sections II consist of the related works regarding the existing technologies. Section III describes the proposed approach consists of speed control, breaking system and anti theft system. Also results shown in section IV and section V concludes the paper.

II.RELATED WORKS

This paper is mainly concentrates on traffic safety. There are generally two kinds of safety systems in automobiles, passive and active safety systems. Seatbelt and Airbag systems are passive safety. The

crash avoiding system is active safety systems that alert the driver to a dangerous situation to help him to prevent the crash [28], [17], [7], [13]. Although early crash detection units used various technologies like infrared waves [6] to detect objects, most crash avoiding systems today work with the help of radar [1]. There are number of mobile robots were designed for avoiding crash [8], [9], [10], [16]. Another method in anti- crash vehicle safety system designed for vehicles safety which uses PIC as the micro controller for controlling the speed of the vehicle autonomously [20], [23].

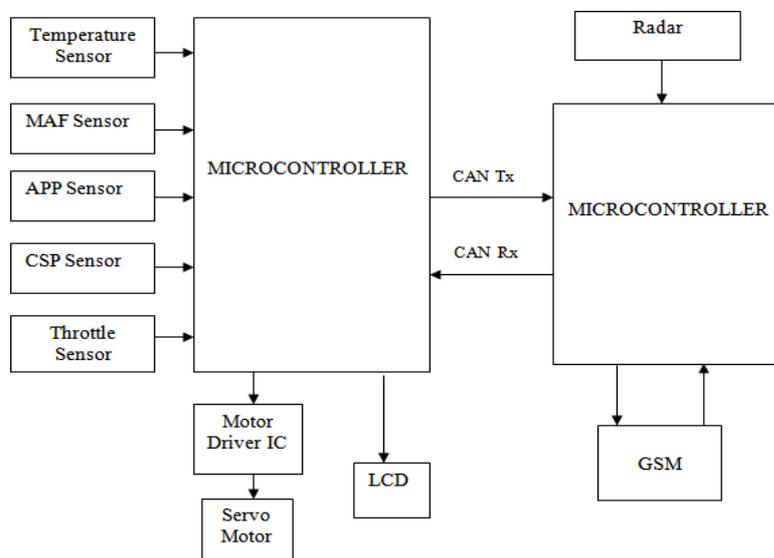
Sai Prabha and M, Roy et.al [27] proposed an embedded safety and security system for vehicle by using atmel AT89S52 microcontroller. Instead of that for providing fast operation, high efficiency and low power consumption V.V. Deotare et.al [25] developed a crash avoidance system using ARM7 as the controller [4], [22], [29]. Another method for collision avoidance tries to prevent a possible collision by limiting the speed of the vehicle in accident-prone areas [2], [15], [24] and in adverse or in bad weather conditions [5], [18], [19]. Kashyap Joshi et.al [3] describes a system which uses sensors to measure various parameters of the car and sends a warning signal to the driver if any of the parameter goes out of range to avoid accidents [4]. Rajarajan.R et.al [12] described a system which avoids collision for automatically applies the brake by means of actuators, distance measuring sensors & electronic control module [21].

Axel Sikora and Manuel Schappacher et.al proposed a highly scalable IEEE802.11p communication and localization subsystem for autonomous urban driving developed an IEEE802.11p standard describes a protocol for car-to-X and mainly for car-to-car- communication [1]. But due to the limitations in scalability and real time location capability the IEEE 802.11p protocol is not ideally suited for these kinds of applications. So it is better to choose a high speed CAN communication protocol for vehicular communication [3], [14].

III. PROPOSED APPROACH

This paper proposes an implementation for data communication based on CAN protocol by using two microcontrollers. CAN communication which is mainly used for vehicular

Fig 1. Proposed system architecture



communication. The proposed system concentrates on vehicle speed control system using sensors that is placed within a vehicle to reduce the speed when there is any dangers that may lie in front of the vehicle. This system, which is provided with obstacle sensing device, gets the obstacle warning in front of the host vehicle, and also the distance that object has been detected. After the data received by the control module from sensing device, the controller actuates the throttle sensor for deceleration.

In the proposed system radar detect the obstacle in front of the vehicle. It is an object detection system that uses radio waves to determine the range, altitude, and direction or speed of objects. There are number of sensors used here to determine their particular values. There are two temperature sensors

are used here. Intake air temperature sensor and Engine coolant temperature sensor. Intake air temperature sensor detects the temperature of the incoming air. Engine coolant temperature sensor measuring the coolant temperature. Mass air flow sensor is used to measure the amount of air engine take in. Accelerator pedal position sensor indicates the position of the accelerator pedal. Here potentiometer is used to vary the speed of the system. Crankshaft position sensor is used to monitor the position or rotational speed of the crankshaft. Throttle position sensor is used to monitor the position of the throttle valve. And the values from these sensors reports to the control unit to accomplish optimal combustion. The microcontroller uses this information to optimize the fuel delivery and the air fuel ratio produces efficient combustion. Radar is connected to the main controller ARM7. The main controller is connected to a low cost processor ATmega.

CAN (Controller area network) is the communication protocol used between the two processors because of its high speed. It is an advanced serial bus system that efficiently supports distributed control system with a very high level of security. Controller area network allow multiple microcontrollers to communicate with each other. Here the servo motor is used to change the position of throttle valve. It works based on the duty cycle of the PWM pulses which is given by the main controller. For every 20ms microcontroller sends PWM pulses to the servo. The electronics inside the servo translate the width of pulses in to a position. Here the servomotor can handle the weight of up to 10kg.

When the system is switched on it scans its surrounding environmental temperature by the temperature sensor and displayed it on LCD. When the vehicle starts the speed and the distance from the obstacle and vehicle is also displayed. An anti theft mechanism will also be implemented in this paper. The main controller will be interfaced to GSM module. GSM modem is a special type of modem which accepts a SIM card, and operates just like a mobile phone. When an unauthorized person starts the vehicle, the system sends a warning message to the authorized person, and if he send a stop message to that number then the vehicle will lock. That is the speed will be zero which is displayed on LCD.

IV. EXPERIMENTAL RESULTS

This paper concentrates on the implementation of data communication based on CAN communication protocol in both hardware and software. The simulation result shows the designing of CAN communication using MATLAB software. The platform used here is simulink. It shows the utilization of CAN network, delay in the delivery of messages from one node to another, normalized relative slip of the wheel and speed of the wheel and vehicle.

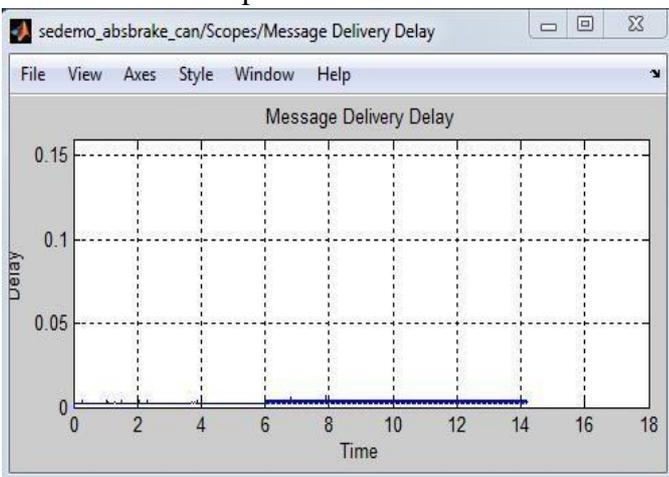


Fig. 2: Utilization of CAN network.

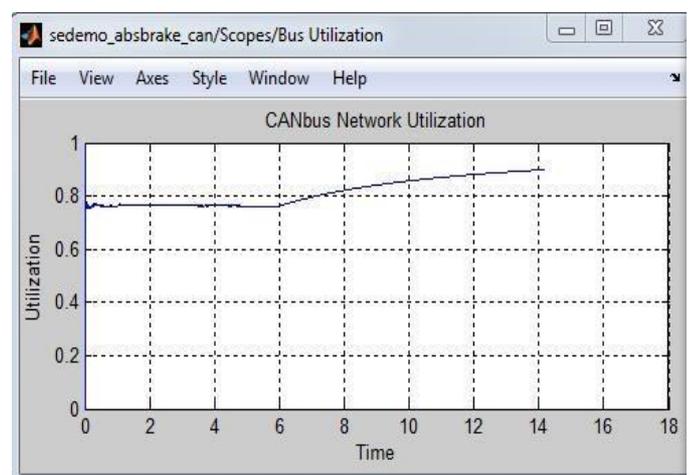


Fig.3: Message delivery delay.

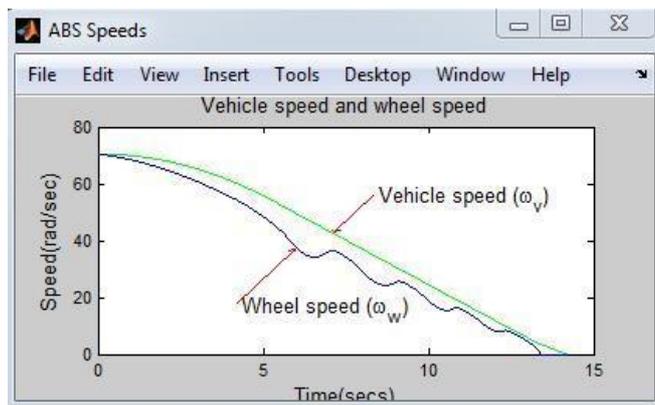


Fig. 4: Speed of the vehicle and wheel.

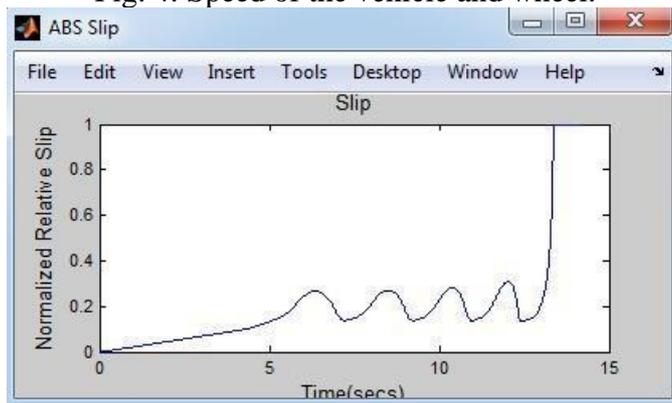


Fig.5 : Normalized relative slip.

Fig. 6: Working model

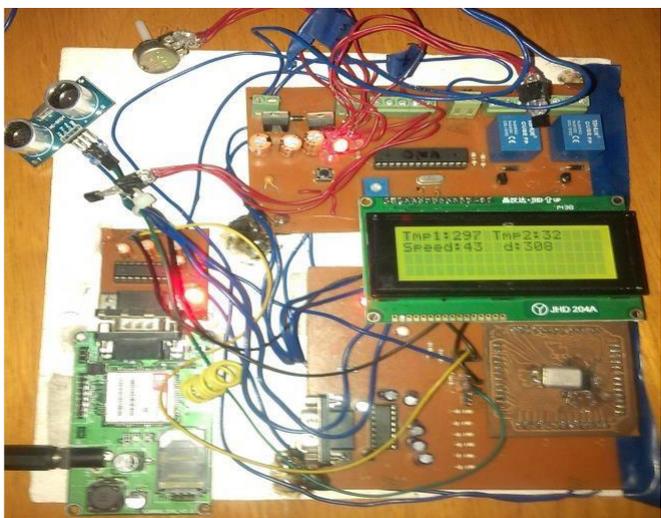


Fig. 7: After obstacle detection



V. CONCLUSION

This paper proposes a system for reducing road accidents and avoiding theft mechanism. That is it can implement a data communication between different microcontrollers by using CAN communication protocol. So the main advantage of this paper is it has high speed communication rate compared to other communication protocol. Initially the speed is controlled by adjusting potentiometer and it is displayed on LCD. Also temperature, distance between the vehicle and the object is displayed. And if the distance is less than the predefined value the speed of the vehicle is reduced by using servo motor. Also an Antitheft mechanism can be implemented in this paper. That is when an unauthorized person

starts the car, then the system becomes active and gives a warning SMS to the authorized user through GSM that the car is being stolen.

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