

Cooprative adaptive cruise control

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Abstract— This paper describes how we can avoid accidents by adopting cooperative adaptive cruise control system in our desired vehicle. By using cooperative adaptive cruise control in vehicles can reduce congestion on highways and smooth travelling on road. ARM cortex m3 controller supports different features for the development of automotive driver assistant system. The sensors are connected to the ARM controller board .Ultrasonic sensor, PIR motion sensor and vibration sensor supports all possible parameters when the vehicle is moving.It consist of two micro controllers . One to manage the approaching maneuver to the leading vehicle and the other to regulate car following once the vehicle joins the platoon.

Keywords— Intelligent Transportation System,Advanced Driver Assistance System

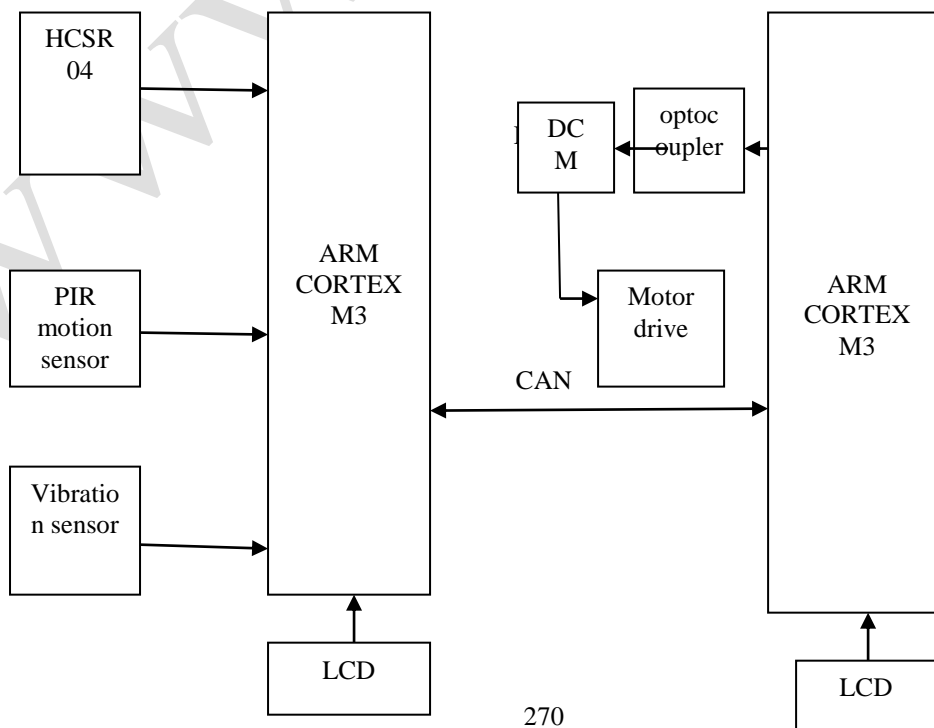
I. INTRODUCTION

Cooperative Adaptive Cruise Control is the extension of Adaptive Cruise Control. It consists of two controllers. Most of the v2v cooperative ITS application has been focused on improving collision avoidance and safety. The extension of the commercially available adaptive cruise control system towards the cooperative adaptive cruise control system has a high potential to improve traffic flow capacity and smoothness, reducing congestion on highways.

II. PREVIOUS WORK

Lots of research has been going in the field of intelligent transportation system, and their application. In design and evaluation of cooperative adaptive cruise control, they have adopted the term string stability and took the string stability time as 1 second. By fixing this time the distance between the vehicles or in other words inter vehicular gap can be controlled. In cooperative driving with a heavy duty truck in mixed traffic approach, the heavy vehicles having efferent capability due to inertia can be controlled. This control method is evaluated in mixed traffic condition. The adopted control strategy utilizes additional information exchange through wireless communication to improve the vehicle following behavior achieved by the underlying adaptive cruise control.

III. BLOCK DIAGRAM





A. *HCSR04(Ultrasonic sensor)*

HCSR04 (Ultrasonic sensor is used for find out the distance between our fully equipped ACC vehicle and other nearby vehicles in the platoon , based on echo method. It provides 2cm to 400 cm non-contact measurement function,

When triggered it sends out a series of ultrasonic pulses and receives echo from the object. The distance between them is calculated by measuring the travelling time of the sound.

B. *PIR sensor*

PIR motion sensor allows to sense motion almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low power, easy to use. They are also referred as PIR, Pyro electric or IR motion sensors

C. *Vibration sensor*

This sensor buffers a piezo electric transducer. As the transducer is displaced from the mechanical neural axis, bending creates strain with in the piezo electric element and generates voltage. It detects any vibration or collision occurs to the vehicle.

D. *ARM cortex m3*

Two ARM controllers are used. One is act as a master and the other is slave. The output of the three sensors is directly given to the first ARM controller. It is a risc general purpose 32 bit controller .The output of the master controller is transferred to the slave controller through CAN protocol.

E. *CAN protocol*

Controller area network is the definition of the high performance communication protocol for serial data communication. The CAN controller of the LPC1768 microcontroller supports two CAN controllers and buses. It transfers information from one controller to the another without leaking any data. It is highly securable serial data transmission.

F. *Optocoupler*

Optocoupler is working in the basis of pulse width modulation concept. It slows down the motor instead of suddenly stopping.

IV. WORKING

Ultrasonic sensor detect the distance between the two vehicles, if the distance of the vehicle is just below the reference value. Then only it get actives and shows vehicle detected in the LCD panel. PIR motion sensor is used for detecting whether a human has moved in or out of the desired area. Vibration sensor vibrates if any collision occurs to the ACC vehicle. These all condition makes the vehicle stops after completing all data transferring through CAN protocol. The output of the three sensors is given to the master microcontroller and their output has been seen from the first LCD. By using CAN protocol the output of the first controller is transferred to the second controller. This is the high speed data transfer method .A DC motor and an opto

coupler is connected to the second controller .The optocoupler output is given to the dc motor ,which is actually an isolator, hence the motor will rotate with a controllable rpm.

V. FUTURE WORK

The system can be enhanced to include GPS and can find out the exact position of the vehicle. It can be used for remote handling smooth traffic control.

VI. CONCLUSION

Cooperative adaptive cruise control vehicle towards ACC vehicle has a high potential to improve traffic flow capacity and smoothness, reducing congestion on highways.

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