Advanced Adaptive Cruise Control System for an Automobile

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ABSTRACT
This paper is an Advanced Adaptive Cruise Control System for an automobile. This provides support to the driver in the task of longitudinal control of their vehicle during motorway driving by using ultrasonic sensor. The system controls the speed of the vehicle using dc motor to maintain a desired distance to the vehicle ahead. This system will also send emergency call message to the predefined number of the user by using GSM if vehicle meet with a critical distance. The send message contains the diver number, using that number to make call to the GPS. The GPS will send the longitude and latitude of the location of the vehicle along with Google map website, using that we can know the location of the vehicle. The cost of this system is expected to be very reasonable.

Keywords---- Ultrasonic Sensor, 16-bit Microcontroller, DC Motor, and Emergency SMS transmit, tracking of the vehicle.

I. INTRODUCTION
Vehicles equipped with new active electronic safety systems are constantly appearing, in an attempt to reduce the risk of accidents. Various types of sensors are used to continuously monitor the distance of both the vehicle and the surrounding environment.

In this paper an ultrasonic Advanced Adaptive Cruise Control system for an automobile is proposed for the control speeds and distances typical in city traffic. Unlike other existing systems, this one only uses the distance measured by the ultrasonic subsystem to control the speed and distance to the preceding vehicle.

II. PROBLEM DEFINITION
The main problem regarding the normal Cruise Control technology is that it is not conscious of other vehicle's movement the driver must be always conscious. Hence, chances of mistakes. Possibility of collision with the headmost of the vehicle if not manually slowed down by the driver.

III. PROPOSED SOLUTION
Advanced Adaptive Cruise Control System for an automobile is used to help the driver in the driving process. When designed with a safe Human-Machine Interface it should increase vehicle safety and more generally road safety. This paper also include vehicle tracking system typically GPS (Global Positioning System) for providing longitude and latitude information of the location of vehicle, and GSM modem which is used to transmit warning message to the predefined number of the user when the vehicle reaches the preset distance set by the driver.

IV. OBJECTIVES OF THE SYSTEM
The goal of Advanced Adaptive Cruise control system for an automobile is to avoid rear end collision by maintaining a safe distance. It reduces the stress of driving in heavy traffic by acting as a longitudinal control pilot. The system makes it possible to accustom the distance to the vehicle ahead without the driver's intervention. objective of the Advanced Adaptive Cruise Control system for an automobile feature that allows a vehicle's cruise control system to accustom the vehicle's speed to the traffic environment.

This paper presents an Advanced Adaptive Cruise Control system for an automobile that can effectively address issues of tracking capability, warning SMS Transmit to the user when the vehicle reaches the critical distance and the system was able to provide a healthy driving experience for the driver.

V. METHODOLOGY
With the features of Adaptive cruise control presently various models are available in market. A laser-based ACC system was offered by Mitsubishi was the first automaker. Later radar based ACC presented by Toyota incorporated. Mercedes introducing ACC system which completely impasse the vehicle if necessary which was further adopted by Bosch and Audi. Stop-and-Go
Active Cruise Control system implemented by BMW's. These cruise control techniques have faced lot of issues related to unsafe operation. These vehicles have major problems they are initially the shooting-up of accelerator un-controllably under certain conditions of cruise control, cruise control not cancelling when the brakes were applied, vehicle accelerating beyond the set speed, vehicle resuming to cruise control on its own resisting the applied brakes, faulty brake problems and speed control problems. So in order to overcome these problems, this paper presents ultrasonic sensors to ensure complete safety to the driver.

**Preferable hardware specifications are:**
- Ultrasonic sensor: HC-SR04
- Microcontroller board: 8051, 16-bit
- Motor: 12V DC motor
- Motor driver board: L293D driver

**Preferable software specifications are:**
- Keil MicroVision, CubeSuite+

### VI. IMPLEMENTATION OF HARDWARE

In this paper, the implementation procedure and the results obtained have been discussed in detail.

Figure 1 shows the block diagram of Advanced Adaptive Cruise Control for an automobile consists of 16-bit Microcontroller, ultrasonic sensor, GSM and GPS module, seven segments display and dc motor. Ultrasonic sensors are electronic devices are used to measure distance from the host vehicle to the target vehicle. The output of ultrasonic sensor is given to the 16-bit renesas controller.

- 16-bit microcontroller reads the output from ultrasonic sensor module HC-SR04 and drives the motors as per our demand.
- 16-bit microcontroller sends signal to the 8-bit microcontroller unit to drive a dc motor.
- 16-bit microcontroller reads the output from ultrasonic sensor module HC-SR04, it will display the distance of the vehicle with the help of seven segments display.
- 16-bit microcontroller enable the SMS transmit controller when the distance of the host vehicle reaches the predefined value of the target distance of the vehicle. We use GSM modem to send the message to the relevant saved number if vehicle meet with preset distance.
- When the user mobile received emergency messages from the SMS transmit unit, the user give a call to the GPS tracker then it will give longitude and latitude information of the location of the vehicle.

![Figure 1 shows the block diagram of Advanced Adaptive Cruise Control for an automobile](image)

### VII. SOFTWARE IMPLEMENTATION FLOW CHART OF THE MAIN PROGRAM

![Figure 2 shows the main program flow chart of Advanced Adaptive Cruise Control system for an automobile](image)
FLOWCHART OF THE SUB PROGRAM

Figure 3 shows the sub program flow chart of Advanced Adaptive Cruise Control system for an automobile.

VIII. RESULTS

This popular ultrasonic distance sensor provides reliable and accurate distance measurements from 2cm to 600cm. It has a focus of less than 15 degrees and an accuracy of about 2mm.

The snapshot of figure 4. Shows the user mobile received warning SMS from the modem unit when the vehicle meet with an accident. Then the user make a call to the GPS tracker unit it will give the longitude and latitude information of the location of the vehicle along with Google map website using that we can get the exact location of the vehicle.

Figure 5 shows the location of the vehicle with the help of Google map when the vehicle reached predefined distance.

IX. COMPLETE HARDWARE SYSTEM

The snapshot of the figure 6. Shows the integrated hardware system consists of HC-SR04 Ultrasonic Sensor System, GSM Modem, GPS Tracker and Motor Control Unit.

Figure 6. Shows Complete Hardware system.

X. FUTURE WORK

Here an attempt is made to understand and implement Advanced Adaptive cruise control for an Automobile. Advanced Adaptive cruise control is an effective method employed and utilized by vehicles.
while on long drive. It helps the driver to relax himself while on long drive and the journey is smoothened. Future of the project provides enhanced functionality at a significantly reduced cost.

The RH850 is Renesas Electronics' latest automotive micro-controller family that offers high performance balanced with very low power consumption over a wide and scalable range of products.

**XI. CONCLUSION**

This Advanced Adaptive Cruise Control system for an automobile can be developed for the purposes of driving safety and comfort. This prototype is very feasible as very less expensive parts are used. In the conclusion we consider how this system can be further improved in future, may be by adding new type of sensors as well as using RTOS design approaches for measuring distance and controlling the speed. Implementing using ARM7 and RTOS.

**REFERENCES**

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