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Co-Operative Adaptive Cruise Control

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***Abstract*: This project is a Co-operative Adaptive Cruise Control which regulates on traffic response on highways or roads. By using ultrasonic sensor, distance between two consecutive vehicles will be measured and according to that CACC system will accelerate or deaccelerate the speed of vehicle to improve the flow stability of traffic. Therefore, by wireless communication through Zigbee of desired parameters such as distance between two consecutive vehicles and differences in vehicle which are not visible in our mirrors by using IR sensor we are going to control the speed of vehicles automatically and maintain the on traffic response for better and fast movement of traffic by this system. The system will control the acceleration and braking module of the vehicle for better movement of traffic and minimizing the stress of drivers.**

***Keywords*: ARM LPC2148, steering angle sensor(QMC5883L), ultrasonic sensor, IR sensor, Zigbee trans receiver**

1. Introduction

Cruise control system is developed for better highway driving experience. Because of increasing demand in the transportation facility an intelligent technology which will help to improve the safety and traffic stability on roads is needed. This need is fulfill by Cooperative Adaptive Cruise Control(CACC) which is an upgraded technology of adaptive cruise control with added feature of information exchange between vehicle to vehicle through a wireless communication. Wireless information exchange between vehicles can contribute significantly for increasing the flow of traffic on roads/highways. The idea of communication between vehicles for safety of drivers and flow stability of traffic first came into act in 1960's in USA. When switched ON, the system starts working on the acceleration and braking of vehicle to maintain a safe distance between other vehicles. Unlike conventional cruise control this system can accelerate vehicle when there is a clear road and can put on a brake on vehicle when the distance between its yonder decreases. Lots of things can go wrong while overtaking the vehicle also such as we can be hit by back side vehicle. So to assist the driver for overtaking purpose the IR sensor will determine the presence or absence of other automotive on either sides of our car. The steering angle sensor also provides extra information to driver of the motion of the yonder vehicle for determining the possibility of overtaking the vehicle in a clean and composed way. Although there will be problems causing to our vehicle which can be figure out using proper car safety products.

2. Methodology

Table 1
Basic components

S. No.	Name of the component	Outlook
1.	Arm Lpc2148	
2.	IR pair sensor	
3.	Ultrasonic Sensor	
4.	Steering angle sensor [qmc5883l]	
5.	Zigbee Trans receiver	
6.	Motor driver ic	
7.	LCD	

The prototype model of cooperative adaptive cruise control system using ARM and Zigbee transceiver working will be

made in following steps:

1. The layout of whole setup will be represented using a block diagram.
2. The ultrasonic sensor will measure the distance which is in front of our vehicle and will revert back its value to microcontroller which will be then displayed on LCD.
3. Then according to the measured distance vehicle will automatically increase or decrease the speed.
4. IR sensors will determine whether there is some other cruise or obstruction on either sides of our vehicle as a assisting medium for overtaking purpose and then will give its output to controller which will be then displayed on LCD monitor.
5. The steering angle QMC5883L sensor will cater the angular position of yonder automotive and will attest the value in degree on LCD for helping the vehicle during turning.
6. Through Zigbee transreceiver the distance calculated by the ultrasonic sensor will be communicated to backside vehicle.

A. Steering angle qmc5883l

This is a multichip 3-axis magneto resistive sensor. It is has its own deterministic characters. It is used to determine the angular position of the vehicle which is resided in front of our vehicle. Is has 16 bit ADC with low noise AMR sensors and wide magnetic field range. Enables 1 to 2 degrees compass heading accuracy with I2C interfacing using standard and fast modes. It consumes low power upto just 75 uA and has wide operational voltage of 2.16 to 3.6V.

1) Hardware framework

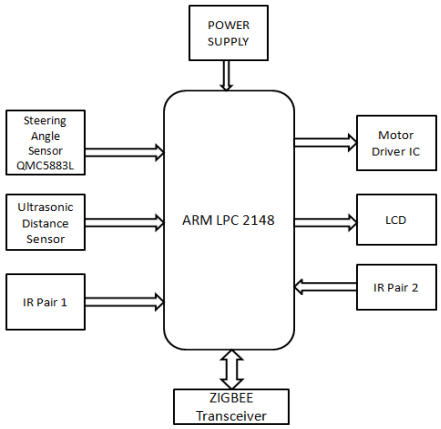

Fig. 1. Hardware framework

2) Zigbee transceiver

The proposed systems communication part is completed using Digi XBee 802.15.4 module as it is easy to use and cost effective RF device. It is having outdoor range upto 300 feet and indoor range upto 100 feet. It works on the frequency band of 2.4GHz and has a data rate upto 250Kbps. Operational voltage of this module is 2.8-3.4 VDC.

3. Conclusion

This research work presents the assistive wireless communication between the vehicles for proper moving of automotives without congestion in traffic. This cruise control system is controlled by LPC2148 using various sensor parameters such as ultrasonic sensor and steering angle QMC5883L sensor. As India is a developing country so it helps to reduce the nerve racking pressure on drivers by automatically braking and speeding up the vehicles. So does it will minimize the road accidents happening by crashing of vehicles because of excessive smog and thereby reducing the visibility of the road drastically which makes hard to drive and overtake.

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