International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

TO DEVELOP A DISTANCE ALGORITHM USING SENSOR NETWORKS FOR ADAPTIVE CRUISE CONTROL

Mahua Bhowmik[1], Nikita Patole[2], Megha Sahane[3] , Prajakta Dolas[4]

[1]Professor,E&TC Dept.D.Y.Patil Institute of Technology,Pimpri Pune-18
[1,2,3]UG Students, E&TC Dept.D.Y.Patil Institute of Technology,Pimpri Pune-18

ABSRACT- We are developing a distance algorithm for adaptive cruise system using V2V communication It includes three modes i.e 1. CC (cruise control) in which vehicle operates in normal mode. 2. ACC (adaptive cruise control) in which rear vehicle automatically reduces its speed when rear car and preceded car comes closer and also it communicate with preceded vehicle using Bluetooth module. 3. CACC (cooperative adaptive cruise control) in this mode rear vehicle reduces speed and also it communicate with preceded vehicle using Bluetooth module. It uses SONAR sensors to detect the distance between 2 vehicles. For this mode we are considering 10m distance limit. Third mode is cooperative adaptive cruise control (CACC) in which rear vehicle will control its speed as well as communicate with preceding vehicle. Rear car will send the distance between them to preceding car and preceding car can send the message to rear car. The distance limit is 5m for this mode.

Keywords: Cooperative Adaptive Cruise Control (CACC),Switching Control, Connected Vehicles, Measurement Distance.

1.INTRODUCTION

Now a days with the ownership of vehicles, increasing all around the world, it has leaded to some traffic problems, including safety, congestion, and air pollution. The most traffic accidents are caused by drivers, distraction and operational error. So, in order to solve the above traffic problems, advance driver assistant systems have become one of the most important technologies in the field of intelligence transportation system.

Adaptive Cruise Control (ACC) is a driver assist system which aims to increase efficiency, comfort and safety of the roads. Additional to the traditional Cruise Control which helps keeping a constant speed, ACC system can detect other vehicles with its sensors and maintain a distance with them. This system is based on vehicle to vehicle communication technology. By this technology vehicles can chat with each other. Information exchanged in the platoon can be omnidirectional or only preceding vehicle send messages to back to the rear. This inspects the safety of constant space controllers and introduce string stability. Controlling the time gap between the vehicles instead of a constant distance is safer.

2. EASE OF USE

It is beneficial for the auto speed controlling to improve the comfort for the driver who would be driving the vehicle. It also senses the information of the vehicles which are at the back and at the front as well. It also measures the distance using the ultrasonic sensor and calculates the distance accordingly. It also sends an intimation on the dash board provided in the vehicle about the distance between the two vehicles.

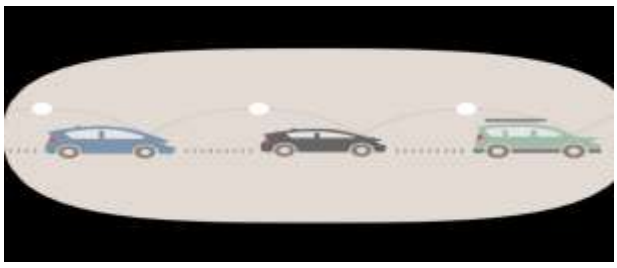

Fig-1:Communication between vehicle

2.1 PROBLEM STATEMENT

Earlier,vehicles would take the task of accelerating or breaking to while driving to maintain a constant speed. But,it could not consider the other vehicles on the road. In accordance to that we have developed a new generation of adaptive cruise control which would maintain safe distance from the vehicles. This system also addresses the concept of vehicle to vehicle communication,distance measurement between them as well as helps to keep the vehicle in safe position with respect to others.

3. LIERATURE SURVEY

1. Adaptive switching method for Adaptive cruise control (Kadir Haspalmutgil and Erkan Adil) Published in International conference on system theory, control and computing,of year 2017. Methodology used in ACC system is two modes i.e. velocity control mode and distance control mode can be used to detect other vehicles with its sensors and to maintain a distance with them. Find the PI controller is used to calculate distance. The limitation is due to finite BW of the controller tracking of the desired acceleration is not perfect.
2. Development and evaluation of cooperative ACC(Peidong wang,jun Jan,Wei Zhao.Qui zhu) Published in International conference on mechatronics and automobiles of year 2015. Methodology used in ACC system reduce fuel consumption.V2V communication can be used for sending to preceding car. The limitation if V2V communication has drawbacks like delay and pocket dropout.
3. A multimode cooperative ACC control model for connected vehicles considering abnormal communication (Li,Wang,Pangwei Wang,Hui Deng)Published in 6th Data driven control and learning system conference in year 2017. Methodology used in V2V communication drawbacks are eliminated by using mode switching method. The limitation of the paper is in this system only preceding car can send message to rear car.

4. SYSTEM IMPLEMENTATION

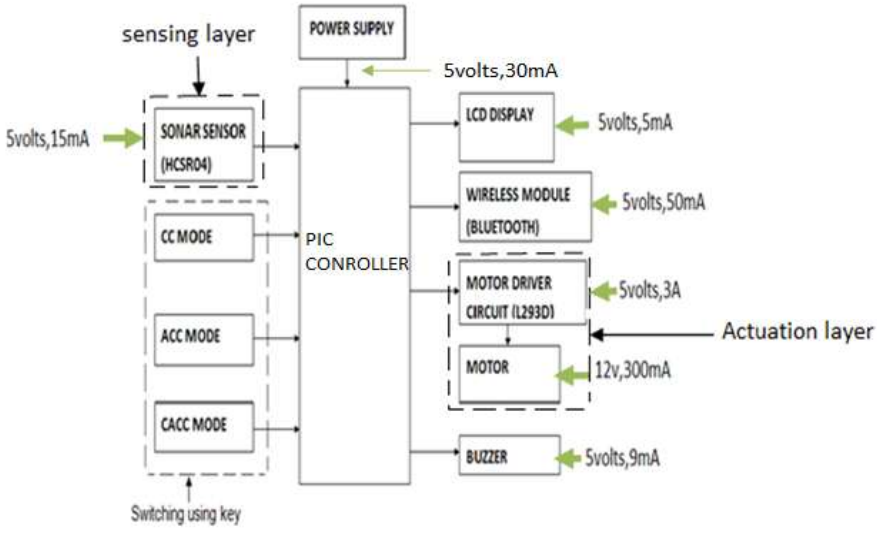

Fig-2:Block diagram of adaptive cruise control

Sonar sensor: Sonar sensor emits short, high frequency sound pulses at regular interval. If they strike an object, then are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time span between emitting the signal and receiving the echo.

In sensing layer we have used SONAR sensor which will sense the preceding car and give the distance between the cars.

Fig-3: A visualization of calculating distance using Sonar Sensor

LCD display: Output of the sensor is given to controller and LCD will display the distance.

Motor IC: Motor driver IC will control the speed of the motor. Whenever the key is pressed the motor would start rotating accordingly.

Wireless module: In CACC mode both the cars will send messages to each other via bluetooth module.Ultrasonic sensor HC-SR04, works on the principle of Sonar Sensor and on timer method. The sensor consists of one input & one output. The trigger pin is used for sending the Ultrasonic Waves. Echo pin is used for receiving the ultrasonic waves using time calculation method. PIC Controller is interfaced with HC-SR04 using Timer Method. When the signal is sent through trigger pin & received through echo pin , if there is any obstacle between sending and receiving the time duration changes and the data is displayed accordingly on the LCD & sent to digital dashboard in the car. If key 1 is pressed and connected to PIC Controller as a digital

INPUTS		OUTPUTS
INPUT 1	INPUT 2	
1	1	START
1	0	REVERSE
0	1	FORWARD
0	0	STOP

Driving Motor 1

INPUTS		OUTPUTS
INPUT 1	INPUT 2	
1	1	START
1	0	REVERSE
0	1	FORWARD
0	0	STOP

Driving Motor 2

input pin , they operate the DC Motor. Then the CC Mode is activated accordingly & displayed on LCD. Also, if any obstacle is away from the sensor then CC mode is activated. If key 2 is pressed and connected to PIC Controller as a digital input pin , they operate the DC Motor. Then , the CACC Mode is activated accordingly & displayed on LCD. If any obstacle is away from the sensor then also CACC Mode is activated. Then the speed of DC Motor is changed and ACC is activated and displayed on LCD. Also, on Smart Dashboard. Motor driver IC will control the DC motor rotations. Its input input pins are 1,2,3,4. Inputs 1 & 2 are intialized for driving motor 1 and Inputs 3 & 4 are initialized for driving motor 2.

Modes of operation : First mode is cruise (CC) in which car will operate normally if there is no preceding car. Second mode is adaptive cruise control (ACC) in which rear car will control its speed according to the distance between rear car . For this mode we are considering 10m distance limit. Third mode is cooperative adaptive cruise control (CACC) in which rear vehicle will control its speed as well as communicate with preceding car can send the distance between them to preceding car can send the message to rear car. The distance limit is 5m for this mode .

5. RESULT

The sensor will send the transmitting wave which would collide with the preceding vehicle and will calculate the time it takes to receive the wave . So, accordingly it would calculate the time taken to receive back the wave and select the required mode (CC , CACC , ACC). Therefore, after that we would get the distance calculated between the two vehicles and it would be displayed on the smart dash board in the vehicle . Then considering the safe distance margin, the brakes would be applied automatically.

6. CONCLUSION

Lacs of people are injured every year due to accident . The lack of awareness on using basic safety features in automobiles like seat belts also paved way for development of ACC, CACC , CC mode. Safety is ensured by selecting the necessity modes. Various spacing policies are analyzed for safety , flow stability , traffic flow capacity and vehicle to vehicle communication strategy. A new inter vehicle spacing policy were demonstrated through experiment. Then, V2V was modified to include the relative velocity between the two vehicles. This result is in spacing policy which is distance stable and yet as safe as constant distance measurement policy.

7. REFERENCES

1. Kadir Haspalamutgil and erkan adail “Adaptive switching mthod for adaptive cruise control”,international conference on sysetm theory,control and computing(2017).
2. Peidong Wang , Zhenping Sun,Jun Tan “Development & Evalution of co-operation Adaptive Cruise controllers”,International Conference on Mechatronics &Automation(2015).
3. Pengwai Wang, Chuan Jiang, “A multi-mode co-operative adaptive cruise switching control model for connected vehicles considering abnormal communication “,6th Data Driven Control & learning system conference(2017).
4. Vicente Milanes, Steven E.shladover,John Spring “Co-operative adaptive cruise controller in real traffic situation”,IEEE Transaction on intelligent transportion system(2013).
5. Rohan kumar, Rajan Pathak,Adaptive cruise control towards a safer driving experience”,International Journal of scientific research (2012).