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# Adjustable distance control for automobiles

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## ABSTRACT

***There has been a considerable growth in almost all the areas, whether it be the human population or the industries. With its compliance, there also has been a large increase in the number of vehicles on the roads. This leads the new technological involvement in this area. The automobile industry today is one of the world's largest coordinated production system. All over the world, every car making company insist to have an Advanced Driver Assistance System. Cruise control in vehicles is becoming more and more a standard accessory in modern cars and it is an important part or feature of Advanced Driving Assistance Systems. In this paper, we proposed a distance control feature for a vehicle in which the user can set the distance between the two vehicles which are host vehicle and the lead vehicle. To improve the safety of the vehicle in traffic or non-traffic area, we alert the driver by giving him or her a warning before the collision which leads to help the driver to maintain distance between two objects. If in case the driver has kept this system on active in rainy weather to prevent collision the system will alert the driver and will maintain safe distances.***

***Keywords***— *ADAS, Adaptive cruise control, Vehicular technology*

## 1. INTRODUCTION

Advanced driver-assistance systems, i.e. ADAS, are developed to help the driver in the driving process. When designed with a safe human-machine interface, they should increase car safety and more generally road safety. Adaptive cruise control is one of the main features of ADAS. Adaptive cruise control for road vehicles automatically adjusts the vehicle speed to maintain a safe distance from vehicles ahead. The control is based on sensor information from on-board sensors. Normal cruise control moves the car on the set speed only but adaptive cruise control speeds the car according to the vehicle in front of it.

In adaptive cruise control, the host vehicle adapts the speed of the front vehicle depending on the internal distance between the two vehicles. It provides with two modes of control, speed and distance control where it not only adjusts the distance between your car and lead car but also adjust speed accordingly. In the existing system, the user can set the predefined speed of the vehicle and can work on some speed limit condition. There are some limitations of adaptive cruise control. Some vehicle manufacturers include warnings about the limitations of these technologies within car manuals. For example, the Volvo XC60 2017 manual states that: "Adaptive Cruise Control does not react to people or animals, or small vehicles such as bicycles and motorcycles. It also does not react to slow-moving, parked or approaching vehicles, or stationary objects." However, Dolf explains that such warnings aren't enough: "A written warning in a car manual is not enough. These assistance systems have to be tested properly and this should be part of the Type Approval test procedure for cars. A car with systems that fail this test procedure, should not be allowed on public roads."[5].

The automobile companies present today are working more on developing adaptive cruise control with speed and distance. There are not paying attention to detecting motorcycles as they are developing ACC for highway lanes. For bad weather conditions, automobiles companies suggest that the driver should take the whole control to himself but the system should at least give warning in such bad conditions before giving control to the driver. Thus, these problems enforced a solution by adding some feature in the present system which will adjust the distance control and will be helpful to avoid collisions even in bad condition such as rain. The system can be used to avoid the collision as it will maintain the relatable gap between vehicles and will give warnings to the driver to have his or her attention.

### 1.1 Problem definition

In Existing system, there is a limitation of essential speed which should be above 25kmph. Also in Stop and go system, it if a lead vehicle stops for more than 3 sec, present cars ACC get disable. And user can increase waiting time to 15 sec and only move if the lead car moves within 15 sec. The proposed system covers these issues. Our car only moves if the lead car moves without any time period as more traffic situation that time interval may be more than 15 sec and system will not have to go from Active to Inactive and vice versa often. Also, there is an existing car which works its ACC on rainy weather so, in the proposed system, the car will move with the speed of less than or equals to 20 KmpH by taking control of distances in rainy days only when the driver allows.

## 2. PROPOSED METHODOLOGY

As per discussed earlier, the existing system is good but there are some limitations. In the proposed system, to overcome these problems, a system with the less inter-gap distance between the

 

vehicles and with the collision warning system in rainy weather is proposed. This proposed system has four-fold objectives which are as follows:

(a) To maintain the velocity under no lead vehicle situation. Here the system will drive the vehicle with a fixed speed.
(b) To maintain the safe distance from the lead vehicle. Here, the system will check for the spacing. The space between the objects and vehicle will be maintained.
(c) To give a warning if the vehicle crosses safe distance. Here, the system should take proper steps according to the situation where the distance between the objects is not secure.
(d) To detect the presence of rain and act accordingly. Here, the system acts in accordance with the weather and give alert to the driver.

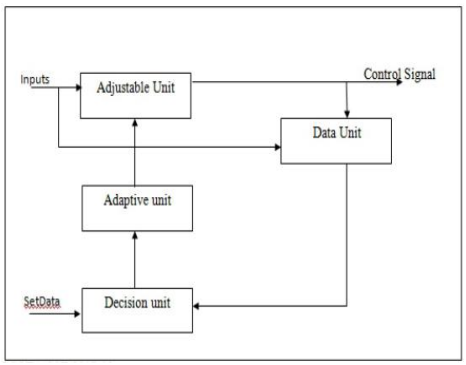


**Fig. 1: Block diagram of the proposed system**

The proposed system is basically consisting of three parts: Distance control unit, Sensor Data unit and Decision unit.

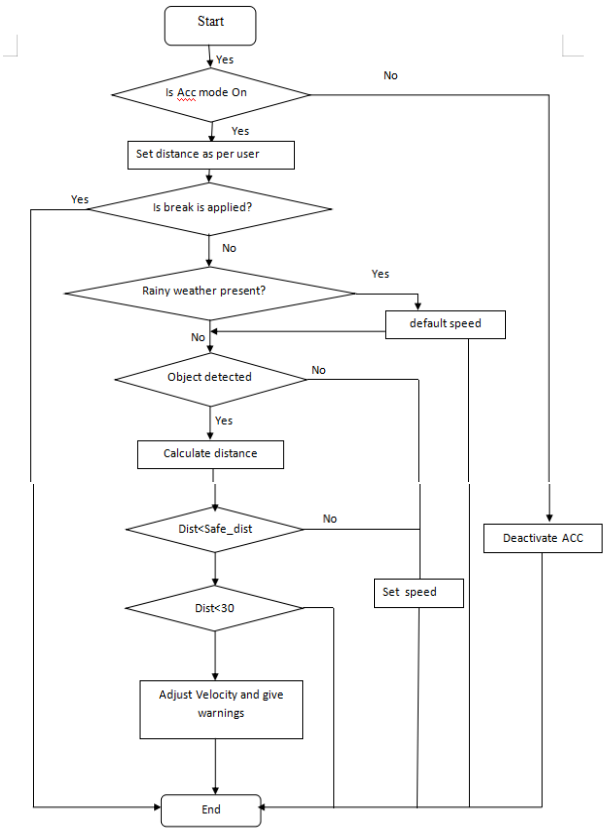


**Fig. 2: Flow chart of the proposed methodology**

Vehicles with ACC move in cruise mode at a preset speed. Rain sensor checks for the rain presence. If rain present and driver has forgotten to deactivate the system the car will cruise with default speed. The ultrasonic sensor sends signals at regular interval and these signals are reflected from the vehicle in front of our car. If the signal is reflected within a safe distance, the presence of a lead object is notified and the speed of the car decelerates or slows down. An adaptive control refers to the algorithm parameter in which adapt to present status in place of a constant set of parameters. It calculates output value for control signals. The value of safe distance, mid-distance and critical distance and preset cruise velocity are inputs to a data unit. Data unit has inputs of set data and observed data. It sends the output as input to the Decision unit where it sends the output as input to the adjustable unit.

In this system, we will use the ultrasonic sensor as the distance measurement unit, rain sensor for detecting range and raspberry pi as a controller.

- When the driver wants to drive the vehicle in our system mode, he selects cruise control mode, the system starts working as shown in figure 2.
- The user sets the minimum distance he wants as a critical distance but it should be above 2m. Depending on the user set distance the ACC mode on condition starts working. The ultrasonic sensor detects the objects.
- If the object is beyond the sight of the host vehicle, or the distance between the object and vehicle is greater than safe distance, the vehicle will cruise with set speed by the driver.
- When the object is detected and distance is mid-distance, the system will give alert by indicating with Led and Buzzer. It will slow down the speed of the vehicle.
- When the distance between object and vehicle is too close i.e. critical distance, the vehicle will stop immediately by giving warning to the driver in the form of Led and Buzzer.
- When the driver activates the cruise control mode and rain starts, the rain sensor will detect the presence of rain and will give warning to the driver. It will slow down the vehicle's speed and the vehicle will cruise with the 20kmph speed.
- When rain detected and distance is close, the message displays output as warning and vehicle stop. Otherwise, the vehicle will move with low speed of 20kmph only if a driver wants.

## 3. CONCLUSION

In this paper, we have proposed a system with adjustable distance control which controls the inter-gap and alerts the driver using a collision warning system. In the existing system, all efforts had made to the developed system in normal weather. Whereas, in our work, we have proposed a cruise control mode in rainy weather. The major focus of our work is to prevent a collision by the detection of objects. Another objective is to maintain the speed of the vehicle under no lead vehicle or object condition and maintain the speed of the vehicle after detection of object and rain.

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