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AUTOMATIC TEMPO CONTROL OF VEHICLE USING MULTI SENSORS

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Abstract
We have lost many precious lives daily due to road accidents. The main reasons are driver error, road situation, and vehicle condition. The system works to help drivers during emergencies and risks. The normal braking system is fully dependent on the driver will never prevent a collision in a sudden critical situation braking and the vehicle tends to crash. The autonomous braking system plays today a big role in accident prevention and the system is unfortunately only used in high cargo vehicles. The system also has speed limiter functions. It will decrease or increase vehicle speed depending on the obstacle distance from the moving vehicle to minimize damage or collision in an accident. The proposed algorithm is recovery braking and release braking based on the time to crash. The suggested design and system can be used in lower-class vehicles to reduce fatality using hybrid data and hybrid sensors. The goal of the research is to perceive the subject and stop the vehicle in an emergency.
Keywords : Hybrid data , Braking System , Sensors , Collision

1.Introduction

The main objective of this survey is to provide various mechanisms applied in automobiles for autonomous braking due to obstacles[7] when the sensor detects any abnormal function[8]. An automatic braking system is an auxiliary system for vehicles that reduces any causes caused by an accident or collision with another vehicle[29], person, or obstacle. There are several modern technologies and innovations available for vehicle safety, but road accidents are increasing day by day. Therefore, to overcome this problem, the only solution is an autonomous collision avoidance system [3]. Only sports cars and other higher-status cars consist of an anti-lock braking system[9], speed sensor[24], and other autonomous systems[1]. But these cars can't be cheap for everyone. So what is needed is autonomous intelligent speed control [4][5] and braking system that can be deployed in any car with the required sensor.

This survey analyzes different autonomous braking algorithms[14] that consider both safety and driving comfort using Time to Collision. The braking algorithm distinguishes the driving situation between the normal braking situation and the emergency braking situation[42] based on the TTC value and performs appropriate braking according to each situation. In addition, several researchers have used a pressure profile to apply smooth braking to achieve low vehicle jerk. In addition, the friction characteristics of the tire and the road were taken into account when calculating the optimal braking force for a normal braking situation[20].

Weather sensors, alcohol sensors, parking sensor[26], ultrasonic sensors, Light sensor[27], tactile proximity sensor[25], IR sensors, temperature sensor[21], and radar sensors, Hall effect sensor[23] ,motion sensor[30] are a few of the most important sensors. Weather sensors measure various parameters such as wind speed and direction, precipitation, barometric pressure, temperature, and relative humidity[22]. The alcohol sensor detects ethanol in the air. An ultrasonic

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sensor is a device that measures the distance to an object using ultrasonic sound waves about the proximity[13] of the object. IR sensors detect[28] an object in the vicinity.

Regenerative braking algorithm [36], Driver Intention Algorithm[37],braking energy recovery method[38], Berkeley Algorithm [40] , Mazda Algorithm[40], recovery braking,release braking algorithm used for the autonomous braking.

2.Literature Survey

Chirantana Kuchimanchi et al, Specify that Automatic collision warning with braking system is a complex large-scale control system, whose design required advances in sensor, actuator, and communication technologies and in techniques of control system synthesis and analysis.[45]

Gopal P et al, Informs that designing the speed control & automatic braking system is strategic control of an accident being vehicles.ultrasonic sensor for detection the obstacle.[46]

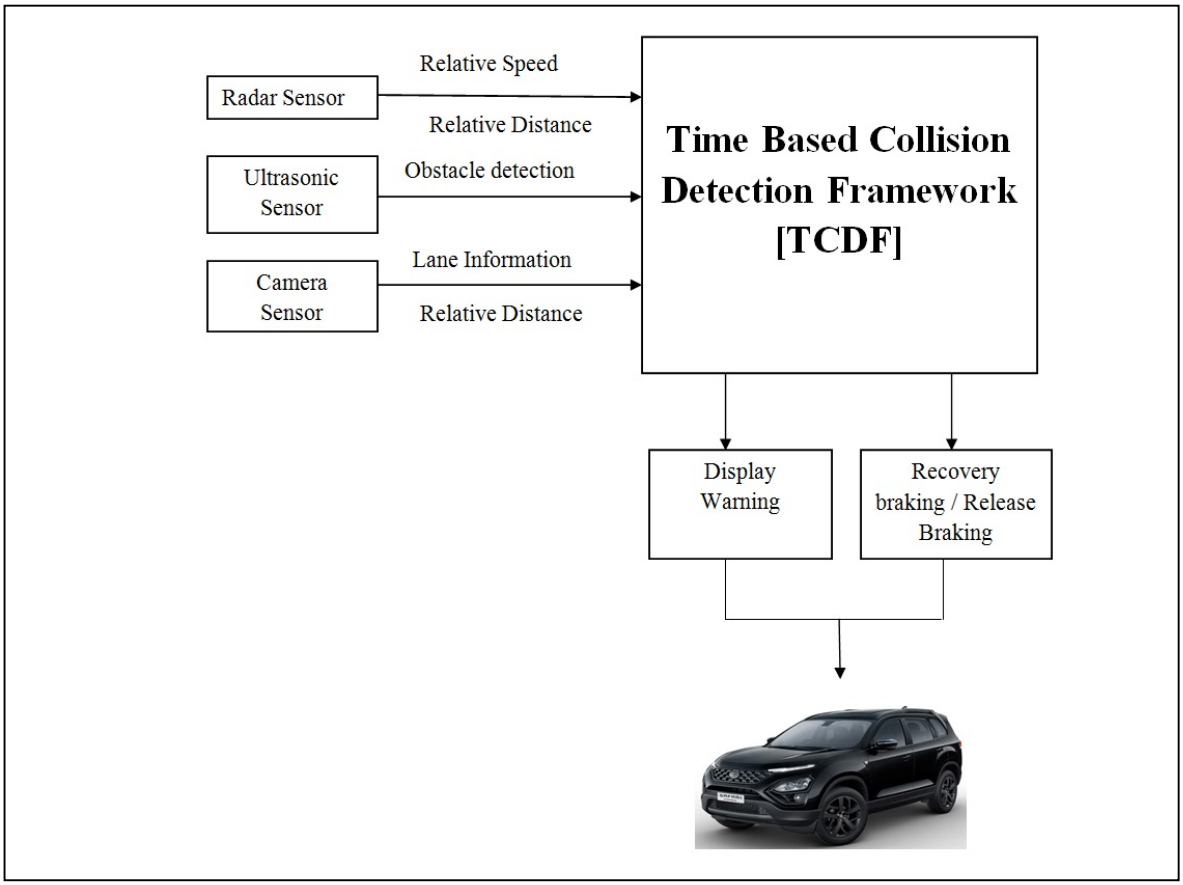
Toshiaki Ohgushi et al , In this paper they concluded A road obstacle detection method using an autoencoder with semantic segmentation that was trained with only data from normal road scenes. Applied for highway Road.[43]

Y.J.Zhang et al, In this system the collision is avoided by the automatic braking, but the driver will not be warned in this type of system. There is a very good chance of wrongly interpreting the signals [44]

Gitanjali Mehta et al, specify that when there is a collision between two vehicles a piezoelectric sensor in front or back part of the vehicle detects the collision impact [6]

From this literature survey the automatic brake is chosen and there are several algorithm which deploy high cost. so we are going to modify this method for low cost cars.

3. Time to Collision Framework



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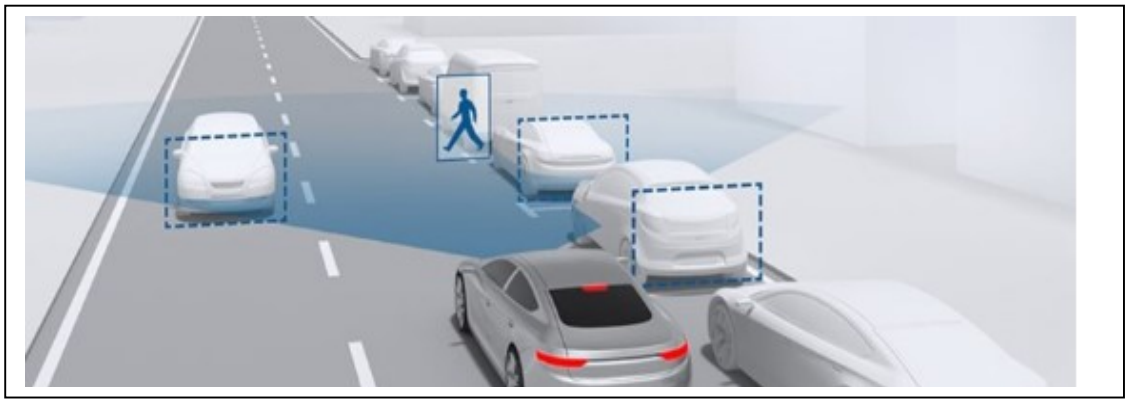
Process Flow

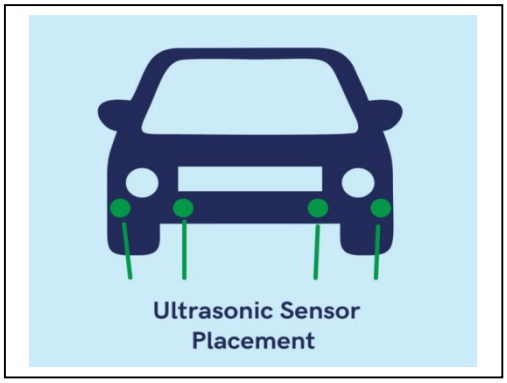
1.The Radar sensor which is used to measure the distance, velocity and movements of objects above wide distances is known as a radar sensor and also measures the relative speed of the noticed object.
2.Ultrasonic sensor used for obstacle detection and distance measurement.
3.Camera sensor used to detect the objects and pedestrians.
4. All the three sensors result send to the TTC based collision detection system.
5.Finally Display the warning to the driver and release braking or recovery braking will be applied to the car.

3.1.Multi Purpose camera and radar complement each other perfectly.

The radar sensor[35] and multipurpose camera[16] combination makes it possible to implement further assistance and safety functions, such as automatic emergency braking to prevent collision with vehicles ahead and protect pedestrians. If the driver doesn't react in the event of an impending rear-end collision and both sensor systems detect the critical object, the assistance function will automatically intervene and trigger a full emergency stop. Sensor data fusion can also significantly enhance comfort and convenience. the adaptive cruise control (ACC) can detect a vehicle entering the driver's own lane much earlier, enabling the system to respond more dynamically. With the help of the radar[2][12], the system can correctly identify the lane in which the cars ahead are driving, thus enhancing the capabilities of the ACC, particularly when cornering. Thanks to sensor data fusion[41], the radar sensor system[11] can include speed limits identified by the camera[17][34] into the driving strategy. This increases the safety and reliability of the driver assistance system.



3.2.Ultrasonic Sensor



ultrasonic sensors [1] necessitate close proximity and slow speeds, advantages include the ability to be accurately used in situations with low visibility, such as in inclement weather conditions and dim areas[9].

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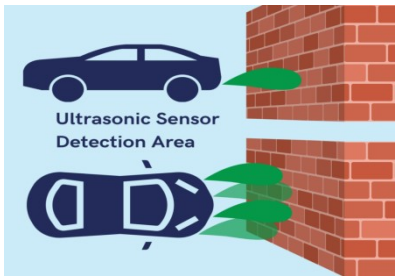


Fig 4 : Ultrasonic sensor works

Autonomous Vehicle use ultrasonic sensor[39] data to detect conditions around the vehicle. Autonomous Vehicle (AV) technology relies on several sensors, including ultrasonic sensors. While ultrasonic sensors within the car can detect conditions in its vicinity, the technology on which autonomous vehicles rely requires big data to work. Utilizing ultrasonic sensor data from millions of connected vehicles is necessary to build AV algorithms. Crowd sourced ultrasonic vehicle data offers benchmarking for a variety of conditions, locations, and scenarios, when used alongside with other parameters, such as weather and hazard data.

3.3 TTC

Time To Collision TTC [19]means the value of time obtained by dividing the distance between the subject vehicle and the target by the relative speed of the subject vehicle and the target, at an instant in time[20].

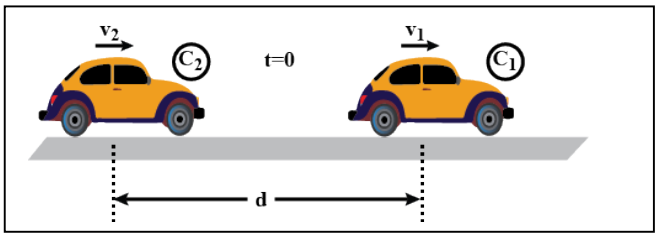
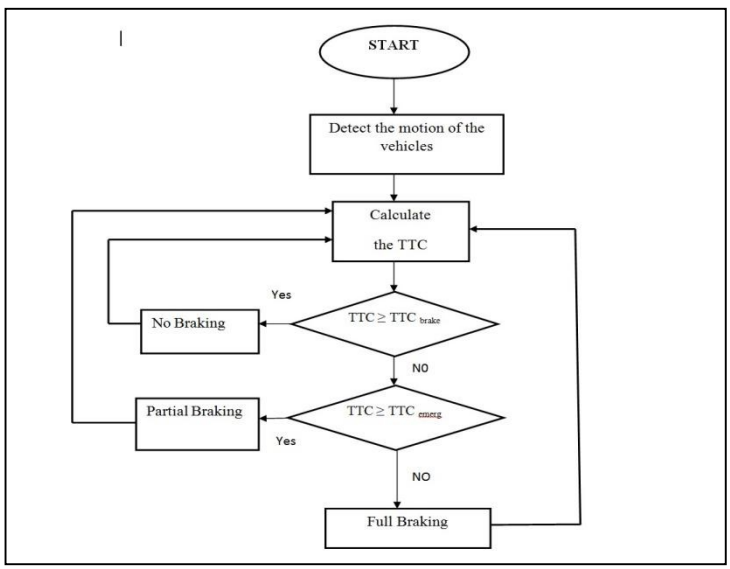


Fig 5 : Predicted relative distance to calculate TTC.

C1 , C2 - Car1 , Car2
V1 , V2 -Velocity of the car 1 , Velocity of the car 2
d- distance
t=0 - Starting time

4.Automatic Braking System



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Conclusion

An autonomous braking algorithm that determines the driving situation to secure the safety of the vehicle and to provide improved ride comfort. The braking algorithm was designed to estimate the driving situation of the vehicle using the TTC calculated from the relative distance, speed, and acceleration between the preceding and following vehicles as well as to provide improved ride comfort by adopting the required braking strategy for each driving situation. The results show that the partial braking algorithm not only guarantees the safety of the vehicle but also provides an improved ride comfort. In addition, we confirmed that the full braking algorithm could be used to avoid a collision in an emergency scenario. Literature survey with so many papers and compared sensors and algorithms. Finally it is observed that selected partial and full braking algorithm and radar sensor, alcohol sensor, camera sensor and ultrasonic sensor.

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