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# VEHICLE COLLISION AVOIDANCE SYSTEM

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**Abstract -** *Nowadays, the number of accidents is so high and uncertain. Accidents causes worst damage, serious injury and even death. These accidents are mostly caused by delay of the driver to hit the brake. Preventive measure such as improving visibility, auto headlights, windshield wipers, tire traction, etc. were deployed to reduce the probability of getting into an accident. Now we are at the stage of actively avoiding accidents as well as providing maximum protection to the vehicle occupants and even pedestrians. Hence in this paper, we make an attempt to propose a new automated vehicle collision avoidance system. This project is designed to develop a new system that can solve this problem where drivers may not brake manually but the vehicles can stop automatically due to obstacles by using sensors. Thus, this paper focuses on the development of a sensor based embedded system that can assist the drivers to avoid any sort of collision on the road in order to save the precious lives and also to prevent the financial loss.*

***Key Words*: Collision, sensors, autobraking, safety, warning.**

## 1. INTRODUCTION

Collision avoidance systems concentrates on advanced ideas such as pre-crash sensing, an ultrasonic sensor is used to sense the object in front of the vehicle and gives the signal to the microcontroller unit. Based on the signal received from the ultrasonic sensor, the microcontroller unit sends a signal to the braking unit for applying the brake automatically. A collision avoidance system, also known as a pre-crash system, forward collision warning system, or collision mitigating system, is an automobile safety system designed to prevent or reduce the severity of a collision.

It uses radar (all-weather) and sometimes laser (LIDAR) and camera (employing image recognition) to detect an imminent crash. GPS sensors can detect fixed dangers such as approaching stop signs through a location database. Once an impending collision is detected, these systems provide a warning to the driver. When the collision becomes imminent, they take action autonomously without any driver input (by braking or steering or both). Collision avoidance by braking is appropriate at low vehicle speeds (e.g. below 50 km/h (31 mph)), while collision avoidance by steering may be more appropriate at higher vehicle speeds if lanes are clear. Cars with collision avoidance may also be equipped with adaptive cruise control, using the same forward-looking sensors.

According to the global road safety partnership annual report 2014 [1], as many as 1.24 million people died each year due to various road accidents occurring throughout the world. Apart from the above-mentioned death toll, almost50 million people become victim of critical life-altering injuries. This is a global humanitarian disaster and this is 8th leading cause of the death globally.

According to the World Health Organization, road traffic injuries caused an estimated 1.35 million deaths worldwide in the year 2016.[6]

According to the 2013 global survey of traffic collisions by the UN World Health Organization, India suffered a road fatality rate of 16.6 per 100,000 people in 2013. India's average traffic collision fatality rate was similar to the world average rate of 17.4 deaths per 100,000 people, less than the low-income countries which averaged 24.1 deaths per 100,000, and higher than the high-income countries which reported the lowest average rate of 9.2 deaths per 100,000 in 2013.[5]

### 1.1 EXISTING SYSTEM

In the existing system, the systems sound an alarm to notify drivers that a collision may be imminent a sound simply to alert the driver and get him or her ready to take evasive action. The accidents are mostly cause by delay of the driver to hit the brake.

An Automated anti-collision system that can detect only obstacles by sharp distance sensor, sends alerts in case the vehicle is in close distance of collision and attempts to stop the vehicle without the help of driving person, has been proposed in [2].

The researchers in [3] aims to design an smart vehicle system that can detect any abnormal condition or accident by sensing various parameters from the seat belt sensor, vehicle black box and the eye blink sensor placed within the vehicle and can automatically inform the traffic police as well as the relatives of the driver about the location of accident via GSM/GPRS technology in case some accident occurs. One-off the major reasons behind the road accidents is driver's inattention towards the road while driving due to their fatigue and drowsiness. The authors in [4] have reviewed various driver alert systems that assists us to prevent or

avoid the collisions on road by applying technologies like digital image processing, electrocardiogram, electroencephalogram etc.

### Disadvantage of existing system

- If the driver does not intervene in spite of the warning there is a possibility of collision.
- Depends on human responsiveness.
- Negligence can lead to accident.
- Does not ensure total security.

## 2. LITERATURE SURVEY

[1.1] Predictive vehicle collision avoidance system using raspberry-bi it seemed like to avoid accidents in the blind spot area using ultrasonic sensor using raspberry-bi module. The ultrasonic sensor works like radar system to detect the obstacles in the blind spot that can Cause the accidence but it is cheaper than it. In addition to that the ultrasonic sensor is used to measure the distance between the vehicle and the obstacles and saved the distance safe before fatalities happened and alerting the driver before the accidence using two ways visualization using light emitting diode (LED) and make a sound using buzzer and the driver alone apply the brake or steering to controlling on the speed. The main advantage of ultrasonic sensor is that it provides highest reliability in getting proximity and has lesser absorption than RF and IR frequencies.

[1.2] Advanced Accident Avoidance System for Automobiles. This paper discussed the most important factors of accident due to the intersection accident and the bad weather and this whether to some extent either the heavy rain, huge ice or high darkness. Indeed, this bad weather conditions the driver feel very harsh to drive the vehicle and can't controlling the car. In this paper there are for types of sensors such as lm35 temperature sensor and humidity sensor and those sensors are used to check the weather states and alert the driver if any thinks happen in the weather. And there are a substation number of ultrasonic sensors to detect the near car and infrared sensors used to detect the forward cars by using burst of light to measure the cars speed, distance and position those sensors were fixed in the both car sides and in the forward of the vehicle to avoid all the cars and any barrier and alert the driver. This system was provided by Global System for Mobile communications (GSM) and Global Positioning System (GPS) module. If the accidence were happened then the system automatically takes position of the car and sends it to the police office and the driver family to save the driver and passenger's health.

[1.3] Internet of Car: Accident Sensing, Indication and Safety with Alert system. In this paper we are discussing how to use ultrasonic sensor and radar system and laser to detect the obstacles such as humans, animals or vehicles and send the car and driver information to the police and their siblings and controlling of the brake system, the steering system and doors. And determine the accidence coordinates and send the data via GSM module in addition to that the data can send the data via Wi-Fi to the twitter. Actually, the main technology used is Obstacle detection & indication sensor in this method we use the photoelectric sensor it mainly consists of transmitter and receiver. In the two side of cars there are two sensors to detect the obstacles. The indicator used the red-light emitting diode (LED) when it finds obstacles. Subsequently the second method is used is passive infrared (PIR) sensor or we can say human detection sensors. The importance of this sensor to detect the human near the car and give the car order to avoid this human. To detect the accidence here they used complex three axis accelerometer. This sensor mainly detects the accidence when the car deviate by angle from the road in addition to that the system were provided by relay circuit to protect the car from battery ignition when the accidence occurs and this system uses GUS designed by android platform to monitor and tracking the vehicle.

[1.4] Vehicle collision avoidance system prototype that will alert drivers to their surroundings and potentially hazardous driving situations. This system is needed to reduce the number of vehicle accidents on the road. Such a system would lead to improved efficiency of the road usage and limit human as well as economic losses. The proposed system will use ultrasonic sensors to provide blind spot coverage, while utilizing long-range radar to detect possible frontal collisions. The system will be implementable on a variety of standard cars with easy installation. While the system will not provide any autonomous action to avoid collisions, it will warn the driver through both audible and visual warnings. The system will be evaluated through rigorous testing in order to develop an algorithm that encompasses most of the countless circumstances encountered on the road. Once the system is implemented, the system will accurately detect the presence of surrounding vehicles with minimal false positives and the driver will be alerted to any possible accident, giving him or her adequate time to respond.

## 3. PROPOSED SYSTEM

The main purpose of the system is to detect and avoid the collision thus preventing the accident. We propose a new system in which the user driving the vehicle will be registered to an application in android device, smart phone etc. Android application will be connected to microcontroller through Bluetooth module. When the user has turned on the application it will be continuously monitoring the system. Thus, this new system is designed to solve the problem where drivers may not be able to brake manually exactly at the required time, but the

vehicle can still stop automatically by sensing the obstacles to avoid an accident.

### 3.1 DIAGRAM

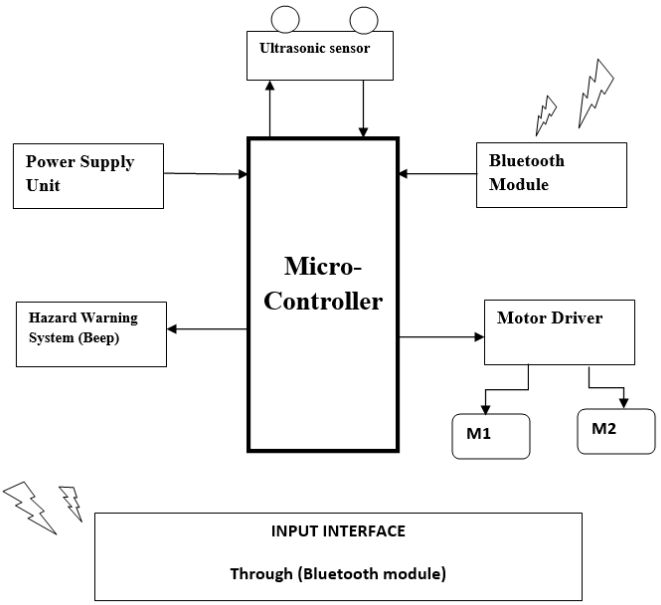


**Fig 1.1** Vehicle Collision Avoidance System Architecture diagram

The above fig 1.1 represents architecture diagram of the proposed system m1 and m2 are the servo motor.

### 3.2 DESIGN

Most automobile collision avoidance systems draw on existing technologies. Since these systems require front-facing sensors, they often pull data from the same sensors that are used by an adaptive cruise control system. Depending on the particular system, those sensors may use radar, lasers, or other techniques to map the physical space in front of a vehicle.

**Autonomous:** The system acts independently of the driver to avoid accidents.

**Emergency:** The system will intervene only in critical situation if the driver doesn't respond in spite of hazard beep.

**Braking:** The system tries to avoid the accident by applying the brakes.

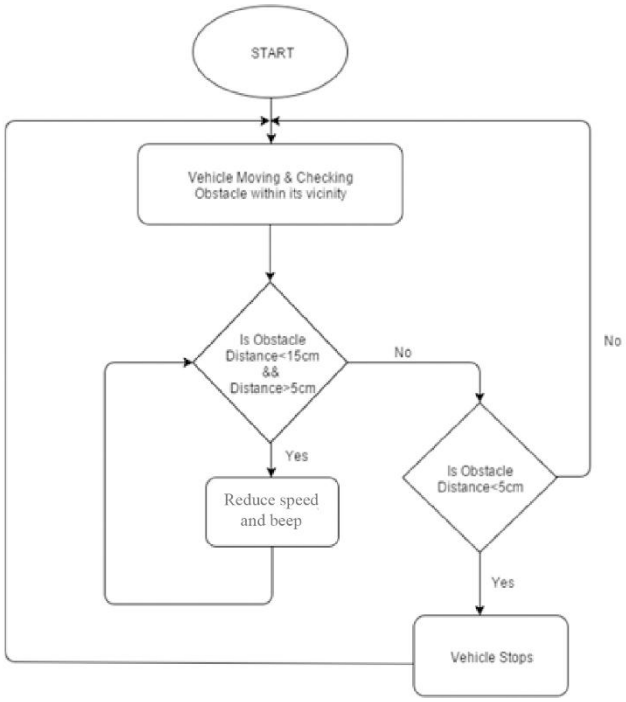


**Fig 1.2** Vehicle Collision Avoidance System data flow diagram

When the system receives data from front-facing sensors, a collision avoidance system performs calculations to determine if there are any potential obstructions present. If the speed differential between the vehicle and any object in front of it is too great, then the system may be capable of performing a handful of different tasks as described in fig 1.2 data flow diagram.

**ALGORITHM**

**Step 1: Initialize the System**

**Step 2: Get the Sensor Data**

**Step 3: If SensedData <15cm and >5cm goto Step 4, else goto Step 5**

**Step 4: Warning to driver through buzzer, goto Step 6**

**Step 5: Reduce Vehicle speed and activate brakes.**

**Step 6: Continue with Step 2**

### 3.3 MODULES

**1. Ultrasonic Sensor:** Ultrasonic Sensor module is low cost, high performance sensor and provides stable and high ranging accuracy. Its ranging distance is 2cm to 350cm with 3mm accuracy. The module includes ultrasonic transmitter, receiver and control circuit. The module is relatively inexpensive, accurate, and easy to interface with a micro-

controller. The HC-SR04 range makes it ideally suited for developing object detection and avoidance schemes.

**2. Micro-Controller:** The role of the micro-controller module is to decide based on the collision risk whether or not to in-terpene (e.g. by warning the driver of an upcoming collision or by applying the brakes autonomously). The decision is forwarded to actuators (motor driver) or human-machine interfaces which perform the required actions. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

**3. Hazard Warning:** Hazard warning module beeps if it finds the minimum distance between the vehicles and alerts the driver to take actions. When the vehicle is at a close proximity It gives signal to the micro-controller to perform autonomous breaking.

**4. Bluetooth Module:** The Bluetooth module has two operating modes; one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin. It is very easy to pair the Bluetooth module with microcontrollers because it operates using the Serial Port Protocol (SPP).

### 3.4 METHODOLOGY

- Collision detection by using ultrasonic sensor.
- Collision indication distance notification on the system with alert beep sound.
- Braking using servomotor connected to rear drum brake parking cable to ensure optimal braking force and minimum braking distance.
- A significant speed differential may indicate that a collision is likely to occur, in which case the system is capable of automatically activating the brakes.

### 3.5 SYSTEM IMPELEMENTATION

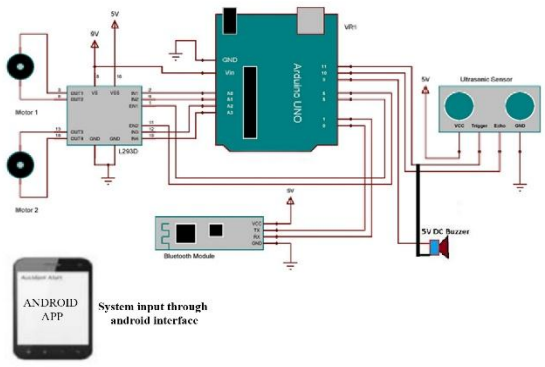


**Fig 1.3** Vehicle Collision Avoidance System implementation diagram

### 3.6 SYSTEM OPERATIONS

Vehicle collision avoidance system performs calculations to determine if there are any potential obstructions present. If the speed differential between the vehicle and any object in front of it is too great, then the system may be capable of performing a handful of different tasks. The simplest collision avoidance systems will issue a warning beep sound at this point, which will hopefully provide the driver with enough advanced warning to hit the brakes or steer away from the obstruction. In some cases, the collision avoidance system may also pre-charge the brakes in conjunction with an automatic braking or emergency brake assistance system. That can provide the driver with a substantial amount of braking power the moment he depresses the pedal, which may effectively reduce the severity of an accident.

- If the car ahead is too close the system prompts the driver to take preventative action with audio and visual warnings.
- If the distance between the two vehicles further diminishes, the system provides a tactile warning beep and applies light braking.
- If an accident appears to be unavoidable, the system applies brakes and avoids collision.

## 4. COMPARISION

### 4.1 Table

| Existing System | Proposed System |
|---|---|
| If the driver does not intervene in spite of the warning there is a possibility of collision. | Collision is avoided by the system even if the driver fails to apply breaks. |
| Depends on human responsiveness. | The system can avoid collision through autonomous breaking. |
| Cannot measure moving objects distance. | Measures and detects distances of moving objects. |
| Does not ensure total safety. | Ensures total safety even in an emergency. |

The above table compares the existing system and the proposed system. We can clearly see that the proposed system overcomes the drawbacks of the existing system.

## 5. CONCLUSION

Collision avoidance system is designed and mounted on a very simple and easily understandable model. The sensors can read distances that are at shorter range accurately. The system takes action automatically without any driver input. Hence this automatic braking system can stop the car to avoid an accident.

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