

## VEHICLE COLLISION DETECTION USING IOT

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### ABSTRACT

Vehicle collision is one of the major causes for the deaths in the world. collision is caused due to distraction of the driver, unaware of surrounding objects and careless driving and etc. collision can be prevented by making driver aware of the objects, good driving disciplines and bringing every information into driver's line of sight can be achieved by collision avoidance system. These system works by collecting data by nearby vehicle and acts accordingly. by using this system in vehicle reduces collision. These systems are easily affordable because of the low cost and efficiency. In these papers we will see working of collision avoidance system with ARM microcontroller and concept of Internet of Things.

**KEYWORDS:** ARM7, Internet of Things, Kalman filter and Sensors.

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### I. INTRODUCTION

In India, major causes of death are road accidents. It will be reduced by employing a Collision avoidance System. this technique is intended to avoid collisions. this technique consists of a microcontroller, GSM, sensors, etc. this technique improves the driver's awareness on the road by observance encompassing vehicles and indicates the collision ahead. The collision avoidance system operates on internet to share information between the vehicles. That information contains speed, location, a distance of the vehicle. This technique uses V2V communication for direct communication between vehicles.

### II. INTERNET OF THINGS

In Internet of Things everything has a unique identity and connected to internet. it allows things to communicate and exchange data. In IOT device communication is done using IP networks with varying communication protocol. data delivery depends on the middle layer hosted in the cloud. here the devices require an active internet connection. it allows an unlimited integration options, but requires solution to manage all communication.

Collaborative driving is a concept that considerably improves road transport safety in addition to decreasing the number of victims in accidents involving automobile vehicles. This innovation is based on information exchanged between vehicles equipped with instruments (for example, sensors) enabling them to perceive what surrounds them and to collaborate in dynamically formed groups. These groups of vehicles, or localized networks, can develop a collective driving strategy which would require little or no intervention from drivers. In the last few years, different automated vehicle architectures have been proposed, but most of them have not, or almost not, tackled the inter-vehicle communication problem.

In collision avoidance system uses V2X communication. V2X communication is of three types they are vehicle to vehicle (V2V) communication, vehicle to infrastructure (V2I) communication and vehicle to person (V2P) communication. Due this system of communication the vehicle stays connected with other vehicles, surrounding infrastructure and person.

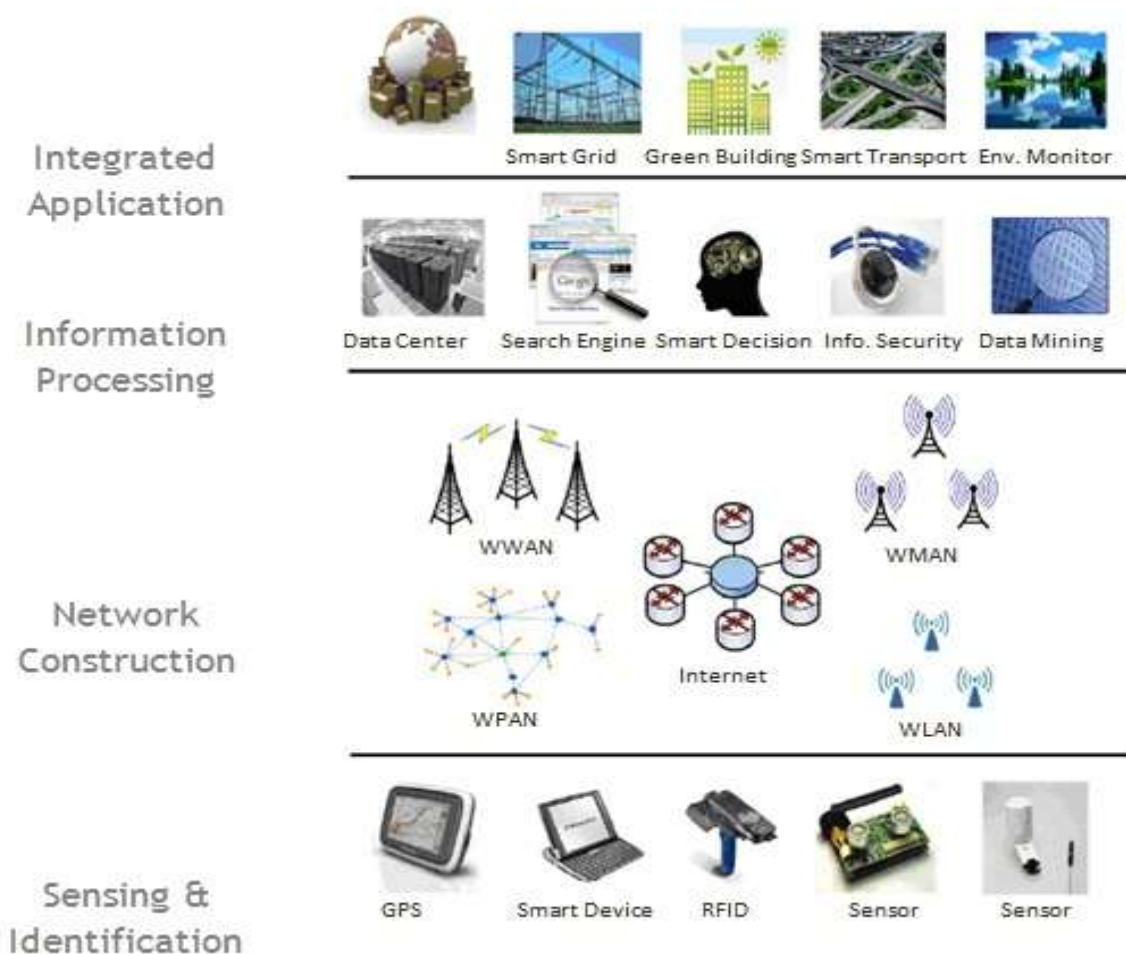
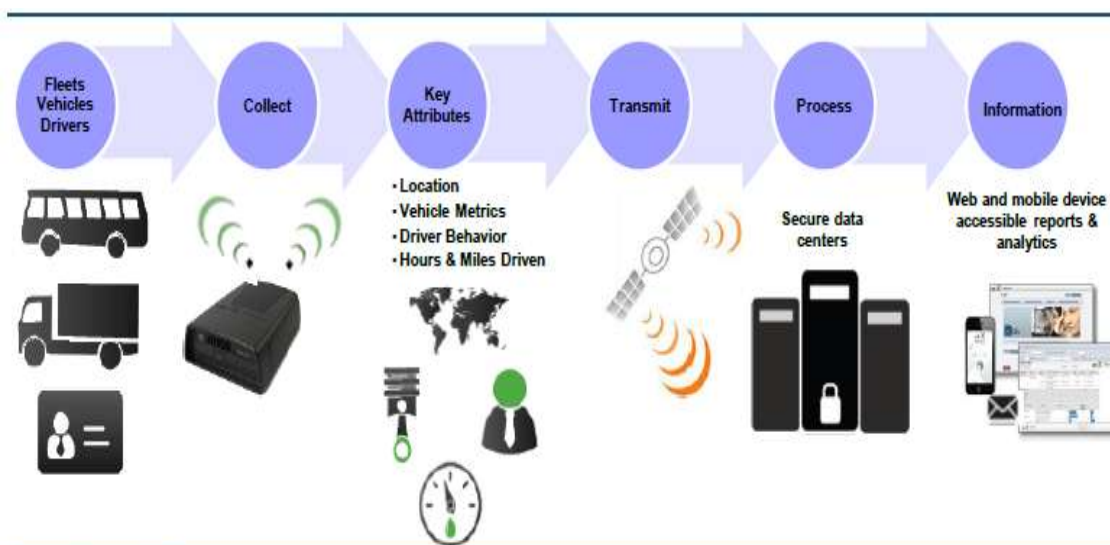


Fig-1: Architecture of IOT



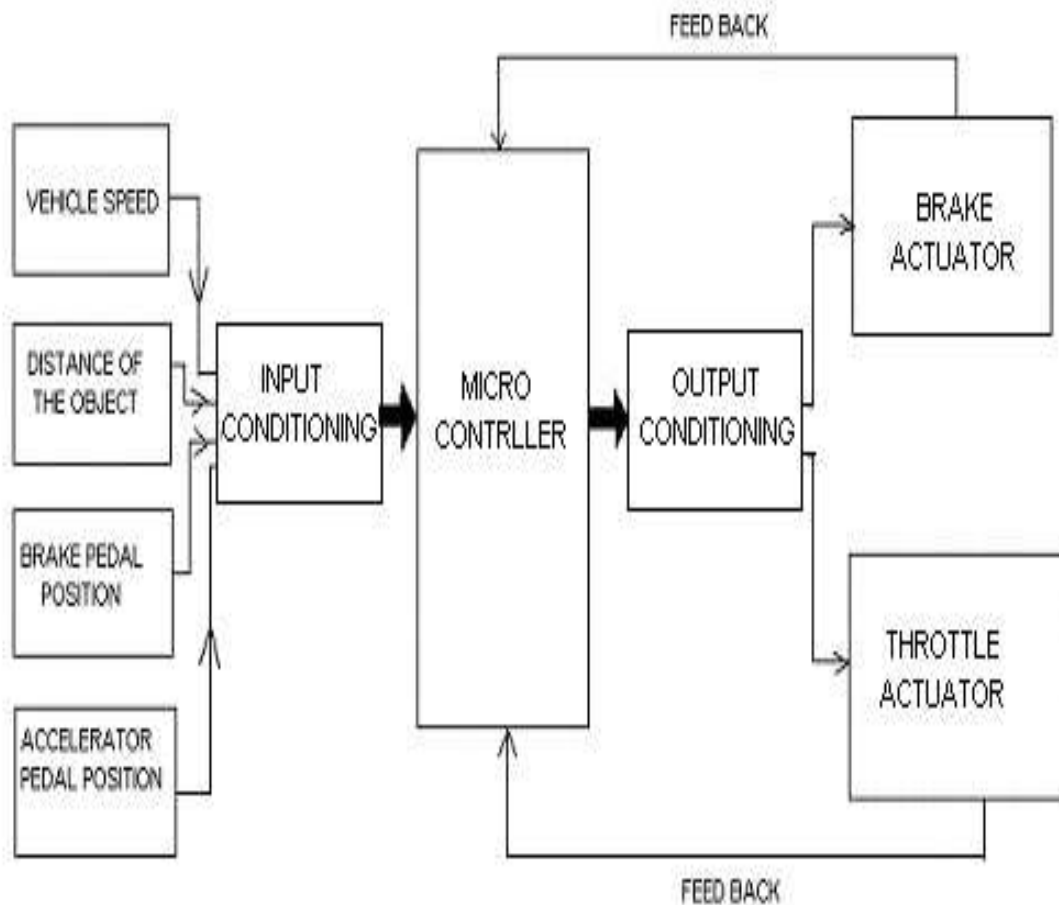
Source: Raymond James research.

Fig.-2: Process of Communication in IOT

### III. COLLISION AVOIDANCE SYSTEM

Microcontroller is that the heart of the collision detection system, it controls each operation of the collision detection system by taking inputs from all the sensors and elements to that. Here we tend to use ARM7 microcontroller, as a result of ARM7 is extremely economical to find resources on the web. Once a collision is detected microcontroller stops the vehicle.

Using the sensors placed within the vehicle the collision detection system takes the data like speed, distance and acceleration of the vehicle and predicts the accident and warns the driver. The collision avoidance system calculates the braking distance and deacceleration distance to prevent the vehicle from the collision. once the vehicle receives information from different vehicles. the system checks whether or not the vehicle is within the deacceleration distance or braking distance. if vehicles in deacceleration distance then throttle mechanism is controlled to stop the vehicle. If the vehicle is in braking distance then each throttle mechanism and brake mechanism area unit controlled for deacceleration and braking of the vehicle to prevent as a result of there'll not spare distance to prevent the vehicle from collision.



**Fig-3:** Collision Detection System

A vehicle speed sensor is used to measure the speed of the vehicle. A radar is used to detect the distance of the object, which passes the radio waves. The position of the brake pedal and the accelerator pedal is identified and given as input to the microcontroller and it acts accordingly. These also contain the information of lane where the vehicle is moving. This system uses the WIFI communication module to exchange information between the other vehicle like speed, distance, lane and acceleration. then the system calculates the possibilities of collision and avoid it. Kalman filter is also known as linear quadratic estimation it estimates the state of the system, it is used in guidance, navigation and control of the vehicle.

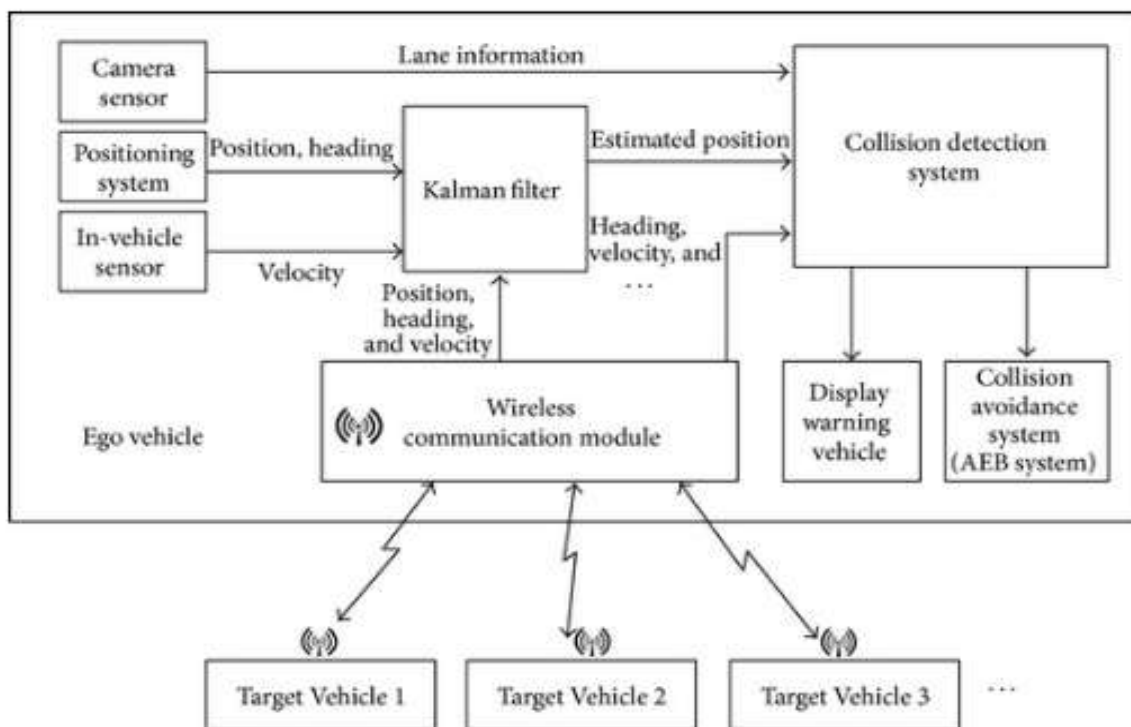


Fig-4: Sensors and other components connected to Collision Avoidance System

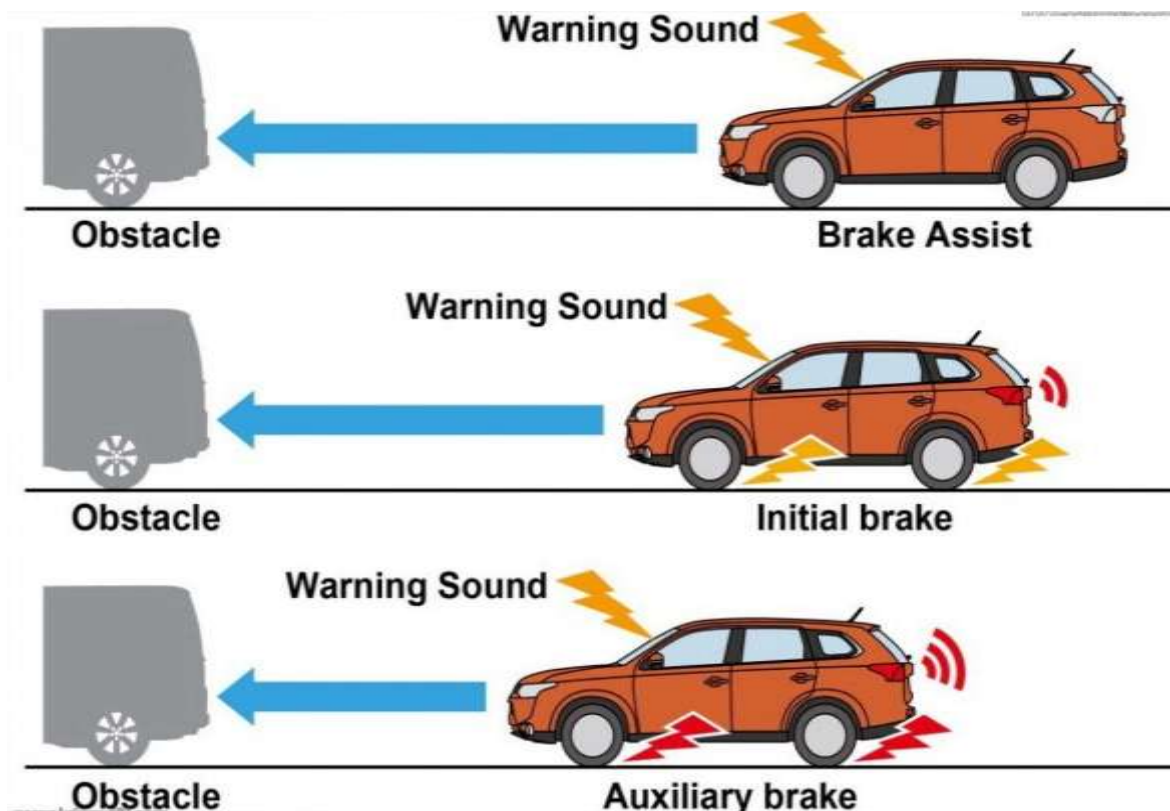


Fig-5: Braking action of car when collision is detected

In warning devices, we normal use audio signals to indicate the collision but it can also distract driver will driving. So instead of using audio or video signals, we can use visual heads-up display, this indicates every information to driver in his line of sight without distraction. Warnings are displayed on the windshield of the vehicle. heads-ups is not only used to indicate warning but also can be used to indicate speed of the vehicle in front. It also indicates if driver change the lane and indicates the danger in advance.



**Fig-6:** Visual Heads-Up Display

#### IV. WORKING OF COLLISION AVOIDANCE SYSTEM

By vehicle speed and air flow rate vehicle path is predicted and using radar obstacle location, relative distance, relative speed and direction angle so collision avoidance system predicts the collision and indicate the driver by warning or applies the brake. After obtaining the velocity, location and target vehicle the system calculates the intersection point of the vehicle and. calculates the difference in time of both vehicles. It predicts the chances of collision, if there is a chance then it triggers the warning. Using GPS and GSM in collision system has more advantage. When collision occurred, using GPS the location of collision can identified and sends coordinates of location to nearby police station and hospital for help using GSM.

Flow Chart

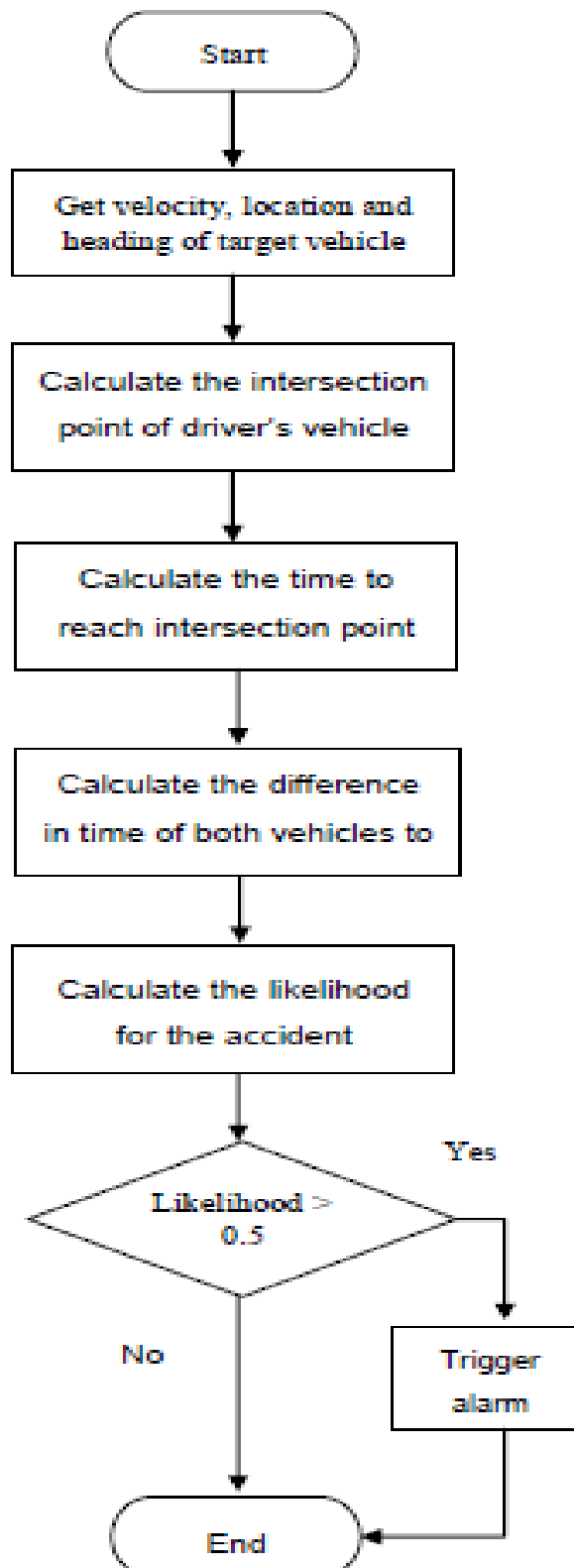


Figure 7. Flowchart of Collision Prediction

Fig-7: Flow chart of Collision Avoidance System [3]

Functions

The main functional units of Collision avoidance system are driver, law enforcer and WIFI-module.

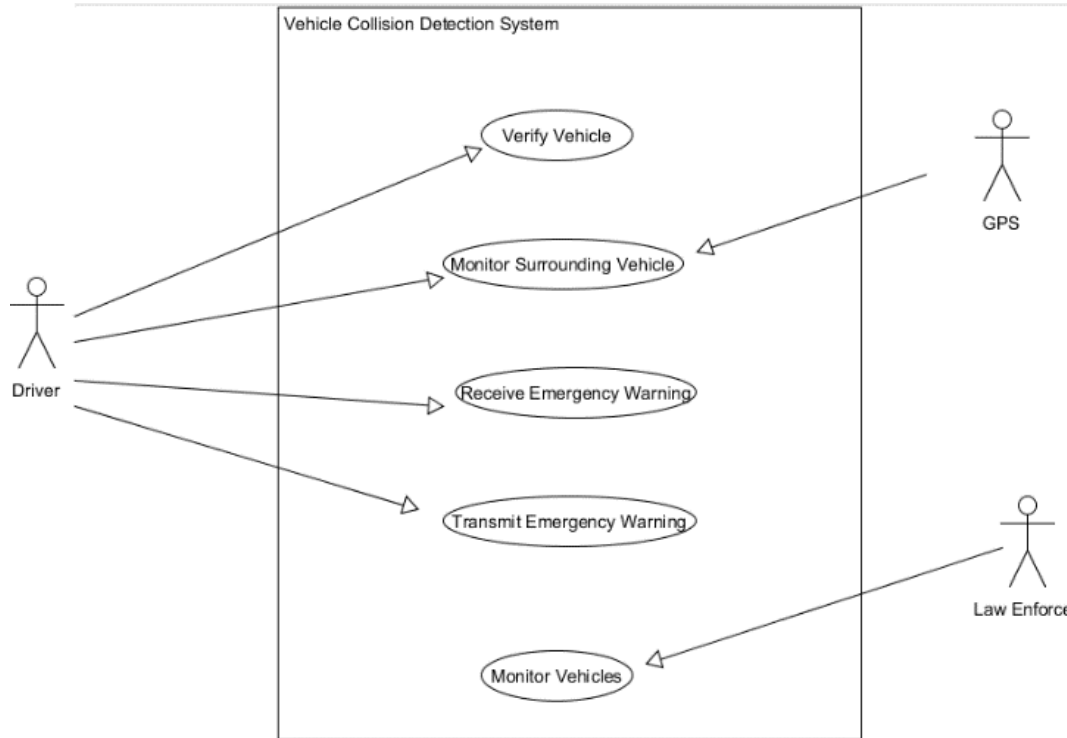


Fig-8: case Diagram [3]

The drivers and law enforcer are dependent on the input from the WIFI-Module and the functions are described in the table below:

Table-1: Function Table of Collision System [3]

Key Players	Conditions	Function
1. Driver	1. Vehicle owner.	1. Verify a vehicle.
	2. Driver should have driving license.	2. Monitor surrounding vehicle.
	3. Collision Avoidance System should be installed in the vehicle.	3. Receive emergency warnings from another vehicle.
		4. Transmit emergency warnings to another vehicle.
2. Law Enforcer	1. Law Enforcer	1. Monitor vehicles
3.WIFI-Module	1. External system which supplies input and output to the system.	1. Monitor surrounding vehicles

V. ADVANTAGES OF COLLISION AVOIDANCE SYSTEM

Improved Visibility:

We need to have proper vision to operate motor vehicle safely, even having proper eyesight will face the collision. Collision Avoidance System improves the visibility.

#### **Enhanced Safety:**

It improves safety by avoiding collision. Not only improves safety of drivers but also increases safety other drivers and pedestrians.

#### **Reduced Expenses:**

When collision takes place there will be damage to vehicle and the people. So, they have to spend money to restore vehicle and recover the health. So, by using collision avoidance system it prevents damage to vehicle and the people.

## **VI. CONCLUSION**

Collision avoidance system reduces accidents by taking certain measures to control the vehicle. In this system Internet of Things uses V2X communication to communicate between the vehicle. In this system we use Automatic Braking System can stop the car to avoid accident. This system can be implemented in trains and aeroplane. We use ARM7 Microcontroller which enables to use internet. Use of Internet of Things will not be difficult because most of the people use internet in daily life. Use of Internet of Things makes our life smarter and easy.

## **VII. ACKNOWLEDGEMENT**

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