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INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY
AN OVERVIEW OF CAR SPEED CONTROL USING BLUETOOTH AND SENSORS

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ABSTRACT
Imagine a world where billions of objects can sense, communicate and share information, all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analysed and used to initiate action, providing a wealth of intelligence for planning, management and decision making. This is the world of the Internet of Things (IOT).there are many applications in various fields like traffic monitoring, health, security, smart living, smart food and water monitoring, smart manufacturing and many more In the current scenario the world is plagued by accidents which are primarily due to human errors in judgment and hence thousands of lives are lost. These accidents can be avoided if only there was a mechanism to alert the driver of approaching danger. This can be done by monitoring the distance between nearby cars and alerting the driver whenever the distance becomes too short. This is precisely the aim of this paper. In this paper we propose the use of Bluetooth Technology by which we can check the speed of the car whenever it comes dangerously close to any other vehicle up front, thereby saving very many lives.

KEYWORDS: Internet of things (IOT), sensors, human errors, mechanism, Bluetooth Technology.

INTRODUCTION
The "Internet of things" (IoT) is becoming an increasingly growing topic of conversation both in the workplace and outside of it. It's a concept that not only has the potential to impact how we live but also how we work. But what exactly is the "Internet of things" and what impact is it going to have on you if any? There are a lot of complexities around the "Internet of things" but I want to stick to the basics The Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet. This includes everything from cell phones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. The analyst firm Gartner says that by 2020 there will be over 26 billion connected devices…that's a lot of connections.

HOW DOES THIS IMPACT YOU?
The new rule for the future is going to be, "anything that can be connected, will be connected." But why on earth would you want so many connected devices talking to each other? There are many examples for what this might look like or what the potential value might be. Say for example you are on your way to a meeting, your car could have access to your calendar and already know the best route to take, if the traffic is heavy your car might send a text to the other party notifying them that you will be late. What if your alarm clock wakes up you at 6 am and then notifies your coffee maker to start brewing coffee for you? What if your office equipment knew when it was running low on supplies and automatically re-ordered more? What if the wearable device you used in the workplace could tell you when and where you were most active and productive and shared that information with other devices that you used while working?

OVERVIEW OF CAUSES OF ACCIDENTS
- Speed
- Alcohol
- Drug use
- Sleep deprivation
- Distraction

AUTOMOBILE SAFETY SYSTEMS

There are generally two kinds of safety systems in automobiles -- passive and active.

A **passive safety system** is anything in a car or truck that, for the most part, sits idle and operates only when necessary. A good example of this is a common seat belt. Once a passenger buckles a seat belt, the belt won't automatically lock into position until the car makes a sudden stop. Some might call airbag systems passive safety, too. However, you could argue that because they rely on impact sensors that determine the severity of an accident, and use that information to determine how quickly they inflate and how long they should stay inflated, airbags could fall into the active safety category.


Figure 1-PASSIVE SAFETY

An **active safety system** is very different from a passive safety system, especially when you're talking about pre-collision systems. Active systems operate based on signals and information gathered, and they typically either alert the driver to a dangerous situation or assist in important maneuvers like steering while braking. These systems actively seek out information in regards to the vehicle's current state.

BLUETOOTH

The communication is subjected to noise and interference, as the 2.4 GHz frequency is shared between all the devices in piconet. The Bluetooth specification has solved this problem by employing what is called as spectrum spreading, in which the Bluetooth radio hops among different frequencies very quickly. There are 79 hops starting at 2.402 GHz and stopping at 2.480 GHz, each of which is displaced by 1 MHz Bluetooth avoids interference by hopping around these 79 frequencies 1600 times per second. So in order to avoid it we use Bluetooth equipped car, in which each car has Bluetooth transmitter and receiver [5]. And every car should have minicomputer to monitor the relative position of the car with the other car as shown in fig. At the 10 dB level, the range is 100 meters, meaning the equipment must be within 100 meters to each other (about 328 feet) to communicate using the Bluetooth standard. With the help of

this technology, we can send data to seven devices (cars). The group of eight devices is known as Piconet. Bluetooth uses master slave configuration which is shown in fig. Our car will monitor seven other cars which are closest to us.
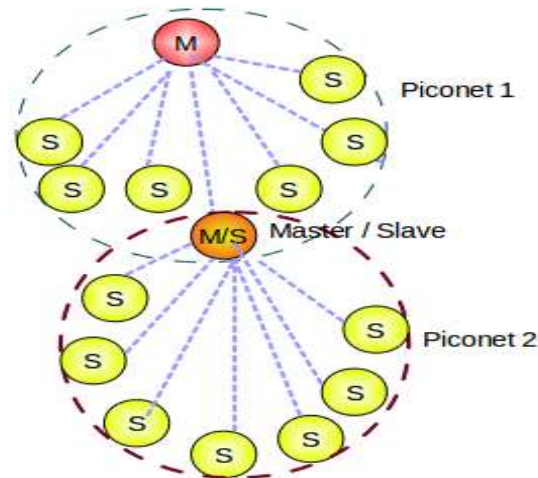
Various techniques and sensors

1.Optical techniques (Passive infrared, laser radar and vision): they all suffer from disadvantage of being sensitive to external environment conditions. Passive infrared and vision does not provide direct measurement of distance to an object. Laser radar is most useful than other technique despite its high cost.

2. Electromagnetic techniques: This consist of FMCW radar, impulse radar and capacitive. Although relatively expensive, FMCW radar seems to be best technique for long range distance measurement. It can be used at short and medium range, rendering a quite flexible technique.

3. Acoustic techniques (Ultrasonic): These are suited in application where only short term relative distance provides high resolution for low cost. Passive infrared: These sensors measure the thermal energy by objects in the vicinity of the sensor. But these sensors are unable to determine precisely the distance to any detected object and have a slow response time.

Laser radar: there are two techniques exit, one uses high power pulsed beam of infrared light, while the other, amplitude of light is modulated with a sine wave. Its limitations are its cost, sensibility to external conditions and need keep laser power within safe levels.

Impulse Radar: It performs as well as FMCW radar in terms of environmental immunity. However this technique presents a sensible diminution in maximum range and is susceptible to external electromagnetic interference. and robust to external environmental effects. They may be useful in slow speed collision warning such as obstacle detection during backup maneuvers.

Vision system: These techniques are based on use of video camera and image processing software. They have high cost and high sensitivity to the external environmental effects makes their use unlikely in most vehicle applications.
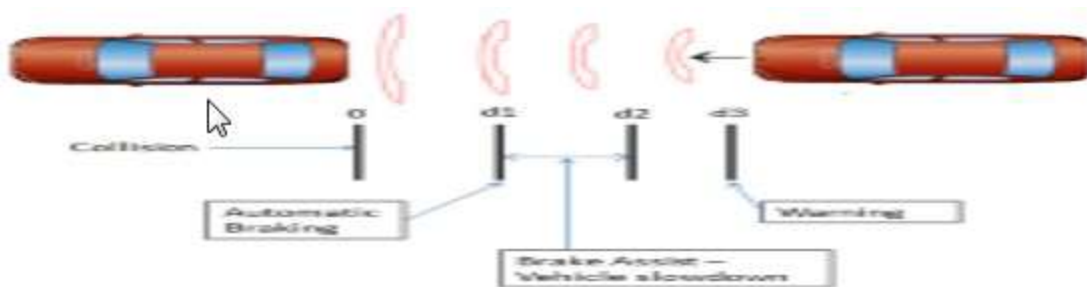
AUTOMATIC BRAKING SYSTEM
The automatic brake system is the next generation braking system for controlling the speed of the car. On receiving the control signal from the travelling car, the computer inside the car manipulates the signal and gives control signal to the braking system. There are four main components of an automatic braking system:
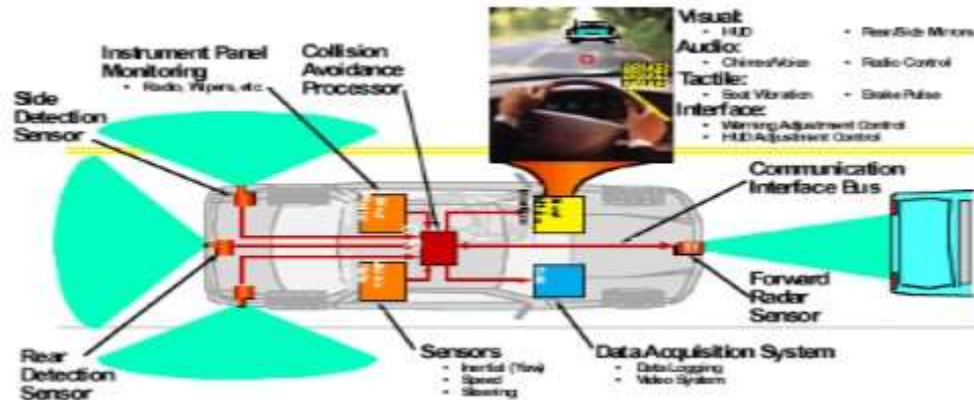
- Speed sensors
- Pump
- Valves
- Controllers

The computer constantly keeps a close eye on the distance between each the nearby cars and when the computer realizes that the distance between the car is too less and can cause a collision it increases the pressure on the breaking circuit by moving the hydraulic valve and as a result increasing the braking force on the wheels. So if the distance between any two cars is less than 100m and the speed is more than 60 km/hr the Bluetooth device gets enabled and if the car gets closer than 10 m the automatic braking system takes control.. After the speed of the car is reduced, the hydraulic valves decreases the pressure on the braking circuit, thus effectively decrease the braking force on the wheels. If the person wants to overtake then the car that wants to overtake will give a overtake signal to the car ahead. Thus both the drivers know about the over take. The following steps show the various functions of the hydraulic valve: In position one, the valve is open; pressure from the master cylinder is passed right through to the brake. In position two, the valve blocks the line, isolating that brake from the master cylinder. This prevents the pressure from rising further and the driver's effort in pushing the brake pedal harder. In position three, the valve releases some of the pressure from the brake. The processed signal from the computer is given to the electromagnet and it gets magnetized and moves the spring downwards, the other end of the spring is attached to the steel plate. The movement of steel plate is nothing but a force and it will add with the force applied by the driver. The signal is then given to the anti-lock braking system and it takes the control.

Automatic braking by the system after sensing an obstacle can be executed in two modes:
Collision avoidance mode: In collision avoidance, 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, especially in the case of radars or lasers. So this is not so effective method of automatic braking.

Collision mitigation mode: In collision mitigation system, the sensors detect the possibility of collision but will not take immediate action. A warning will be sent to the driver in the form of a signal or a voice message. There is a

threshold safe distance calculated by the system and if the driver fails to respond even when the vehicle crosses that region, then only brakes will be applied automatically. Even if there is a mis-interpretation of signals, there is no problem because, the decision to apply brakes is left with the driver and the brakes are applied automatically only in the most emergency situations.

Pre-collision systems place small radar detectors up near the front of the car, usually within the grill, where they constantly send out quick bursts of high-frequency radar waves. These waves will bounce off the nearest objects and return to the sensor, where a separate unit connected to the sensor calculates how long it took for the signal to leave and bounce back. With this information, a PCS unit can determine another car's position, distance, speed and relative velocity almost immediately, and if any sudden changes in those factors could potentially cause a collision, the system can provide information or assist the driver in avoiding a potential accident Crash avoidance systems can be classified into three main categories:

- Low Speed system – this version targets city driving where crashes often occur at low speeds but can cause debilitating injury such as whiplash injuries. Typically, these systems look for the reflectivity of other vehicles and are not as sensitive to pedestrians or roadside objects.
- Higher Speed system – this version typically utilises long range radar to scan further ahead of the vehicle (up to 200 metres) at higher speeds.
- Pedestrians – these versions use a camera combined with radar to detect vulnerable road users through their shape and characteristics. The way in which pedestrians move relative to the path of the vehicle is calculated to determine whether they are in danger of being struck.

These three systems of automatic braking system are not mutually exclusive and there are vehicles that may have two or more versions. It is important to note that within each type of system there will also be variation in functionality depending on the manufacturer and even car model (in terms of warnings, braking function, time-to-collision etc.,

CASE STUDY
SUBARU EYESIGHT TECHNOLOGY

Developed by Subaru engineers, it's our most significant leap in crash prevention since our invention of Symmetrical All-Wheel Drive. Eyesight is an extra set of eyes on the road, and if need be, an extra foot on the brake when you drive. When equipped with Subaru Eyesight, the 2015 Subaru Forester, Impreza, Legacy, Outback, and XV Crosstrek models received the highest possible score in front crash prevention by the IIHS.

You may even be eligible for additional Vehicle Safety Feature savings on your auto insurance if your vehicle has options such as Subaru Eyesight.

Eyesight is available on select Subaru Forester, Impreza, Legacy, Outback, WRX, and XV Crosstrek models. IIHS(Insurance Institute Of Highway safety) RATINGS Subaru models equipped with optional Eyesight receive the highest possible ratings in IIHS front crash prevention tests. See how the Insurance Institute for Highway Safety rated Subaru vehicles compared to the competition.

| Features	2015 Subaru Legacy	2015 Honda Accord	2015 Ford Fusion	2015 Toyota Camry	2015 BMW 3 Series
IIHS Test Performance	Superior Rating	Basic Rating	Basic Rating	Advanced Rating	Advanced Rating
Pre-Collision Warning	Yes	Yes	Yes	Yes	Yes
Pre-Collision Braking	Yes	No	No	Yes	Yes
Pre-Collision Throttle Management	Yes	No	No	No	No
Lane Departure Warning	Yes	Yes	Yes	Yes	Yes
Adaptive Cruise Control	Yes	Yes	Yes	Yes	Yes
Starting Equipped MSRP*	$24,690	$33,630	$30,485	$30,725	$43,700

EYESIGHT FEATURES
SUBARU EYESIGHT TECHNOLOGY
Eyesight is an extra set of eyes on the road, and if need be, an extra foot on the brake when you drive. When equipped with Subaru Eyesight, the 2015 Subaru Forester, Impreza, Legacy, Outback, and XV Crosstrek models received the highest possible score in front crash prevention by the IIHS.

PRE COLLISION BRAKING
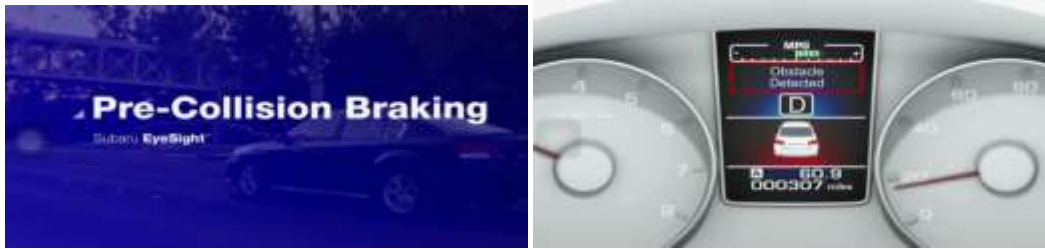
Pre collision braking helps you avoid or reduce frontal impacts by alerting you and applying full braking force in emergency situations.

**PRE COLLISION THROTTLE MANAGEMENT**

Eyesight detects objects in front that you are likely to hit, it will reduce the power from the engine to help minimise the possible impact force and frontal impact damage.

- **ADAPTIVE CRUISE CONTROL**

To keep a safe distance from the car in front of you chose the distance you want to preserve, and eyesight will automatically adjust your speed to maintain your selected distance.

LAND DEPARTURE AND SWAY WARNING
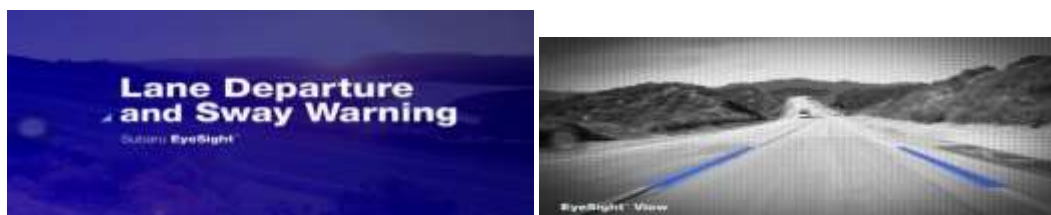
Eyesight monitors your position on the road and will alert you unintentionally stray out of your lane.

CONCLUSION

Thus the paper clearly emphasis that the road accidents are due to the driver's errors while driving, and hence traffic accidents keep with a yearly increasing of a high rate. This paper gives an overview of the obstacle detection algorithms by the use of internet of things (IOT) under its various applications. The safety theory proposed in the paper is an intelligent EYESIGHT technology which can avoid or lessen the graph of road accidents. The proposed eyesight technology includes four features- pre-collision braking, pre-collision throttle management, adaptive cruise control, lane departure and sway warning. Implementation of this technology in every car can minimise the accidents and make the world a better place to live.

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