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Accident Prevention via Bluetooth

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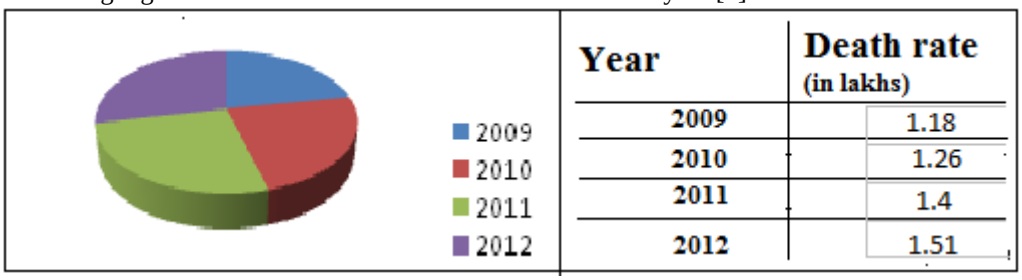
Abstract-In India there has been an increase of 17.4% in the total number of road accidents during the period of 2011-2012.This percentage has raised eyebrows and caught the attention of many to curb the growing rate. It is found that 80% of the times it is the fault of the driver. This can be avoided if we could device a mechanism which could alert the driver about the coming jeopardy. This can be achieved by monitoring the distance between two cars using Bluetooth. If the distance decreases than the one specified, the driver would be signalled and according to the signal, necessary actions will be taken by the mini gadget present in the car. This paper proposes that with the help of Bluetooth technology, we can keep track of the speed of the car and take appropriate actions to avoid accidents.

***Keywords:-*Bluetooth, accidents, break system, cars.**

I. INTRODUCTION

As India sees a sharp rise in sale of personal vehicles, it is witness to another unfortunate rise, in number of deaths in road mishaps — around 1,05,000 every year, reports World Health Organisation in its report on "Decade of Action for Road Safety 2011-2020" . By using Bluetooth technology this number can be decreased. Bluetooth is a short-range radio link intended to replace the cable(s) connecting portable and/or fixed electronic devices. Key features are robustness, low complexity, low power and low cost At a given point of time, Bluetooth devices can communicate with eight other similar devices. Thus 8 cars having Bluetooth enabled can communicate with each other within a distance of 100 meters. The range is dependent on the power class of the product. Power transmission rates vary in many Bluetooth devices depending upon the power saving features available in a particular unit, bandwidth requirements, transmission distance. We can use this feature of Bluetooth to avoid accidents, as any car comes closer to another than the specified distance, the driver will be alarmed about the same and the speed of the car will be decreased only if the speed of the car or any other in the radius of 10 m is more than 40 kmph. If the speed is less, then the driver will only be indicated about the nearby cars. The below fig 1 gives us an idea about the death rate in the last 4 year.[7]



Year	Death rate (in lakhs)
2009	1.18
2010	1.26
2011	1.4
2012	1.51

Fig 1 Death rate in the last four years

II. WHY CHOOSE BLUETOOTH TECHNOLOGY OVER RADAR SENSORS??

- Time - Radar can take up to 2 seconds to lock on.
- Radar has wide beam spread (50 ft diameter over 200 ft. range).
- Cannot track if deceleration is greater than one mph/second.
- Large targets close to radar can saturate receiver.
- Hand-held modulation can falsify readings.
- More interference sources.

III. WHY CHOOSE BLUETOOTH TECHNOLOGY OVER GPS??

- Price of a GPS system can be a major disadvantage. If you purchase a "bargain GPS," you will get what you pay for, and features such as traffic and up-to-date maps could be lacking.
- GPS devices are limited by having clear access to the satellites that provide the tracking. In locations with tall buildings or sparse coverage, reception can be poor.
- Turn-by-turn directions are not available on every type of GPS device. Some devices will give very little advanced notice before an upcoming turn.

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- Maps on GPS devices are not updated in real time for all models. This means that it is possible that a GPS device will direct you onto a road that is closed or no longer exists. It could also miss new roads and businesses.
- GPS units that are not plugged into a power source, and rely on batteries, which can drain quickly. This can increase the cost of owning a GPS unit significantly.

IV. BLUETOOTH

Bluetooth has been designed to operate in noisy radio frequency environments, and uses a fast acknowledgement and a frequency-hopping scheme to make the communications link robust, communication-wise and sent a signal. Bluetooth radio modules avoid interference from other signals by hopping to a new frequency after transmitting or receiving a packet. Compared with other systems operating in the same frequency band, the Bluetooth radio typically hops faster and uses shorter packets. This is because short packages and fast hopping limit the impact of microwave ovens and other sources of disturbances. Use of Forward Error Correction (FEC) limits the impact of random noise on long-distance links.

V. OPERATION

The Bluetooth radio is a short distance, low power radio operating in the unlicensed spectrum of 2.4 GHz and using a nominal antenna power of 20 dB. [1][2]The modulation used in Bluetooth is Gaussian frequency shift keying, in which zeros are represented by low frequency and ones are represented by high frequency as shown in the figure 2.

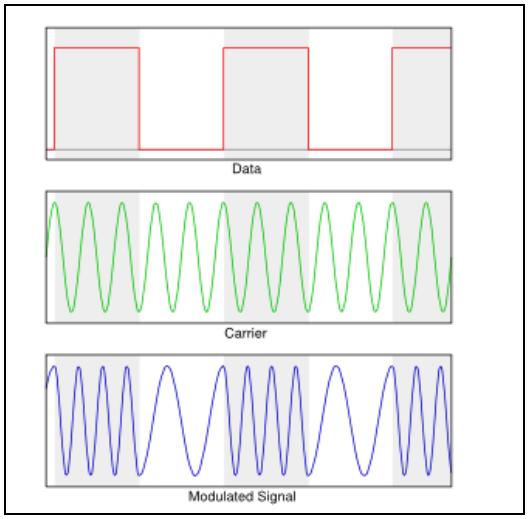

Fig 2 Modulation used in Bluetooth

A. 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 3. 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 Figure 3. and Figure 4 shows the screen of the computer inside our car. Our car will monitor seven other cars which are closest to us. Based on the distance the tabulation is plotted.

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Fig 3. How does the pc card receives the signal

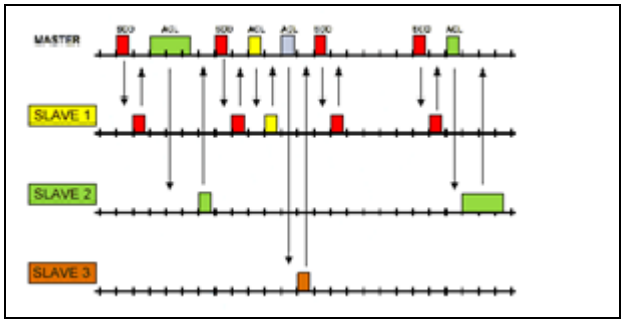

Fig 4 Master slave configuration of Bluetooth

Name of the vehicle	Distance from the car	Speed of the car	Position of the car
Car 4	6m	40kmph	left
Car 8	10m	0kmph	Top left
Car 2	18m	30 kmph	Bottom left
Car 7	25m	30kmph	Bottom right

Fig 5. User's car display

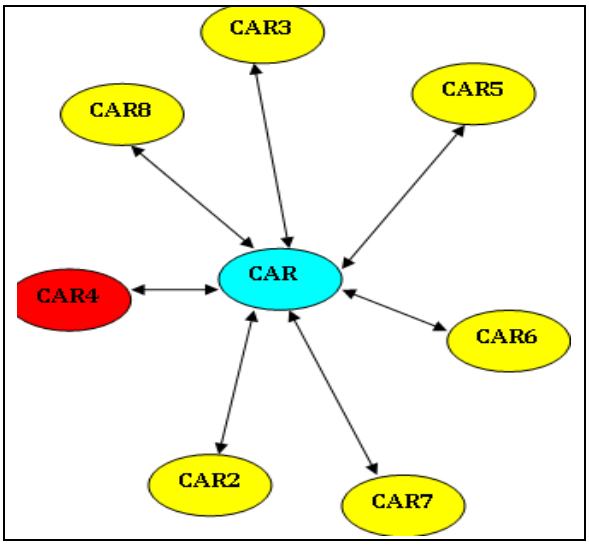

Fig.6 Shows the neighboring cars

B.RFID

Radio frequency identification is a technique used in tracking and identification of obstacles using radio waves. It consists of readers & tags. Most of the RFID tags contain: Integrated circuit for storing & processing the information and modulates and demodulates the signal.

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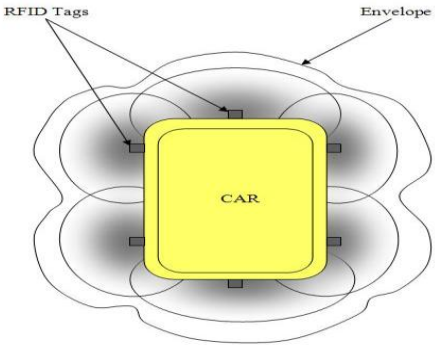

Fig 7: Radio frequency identification device

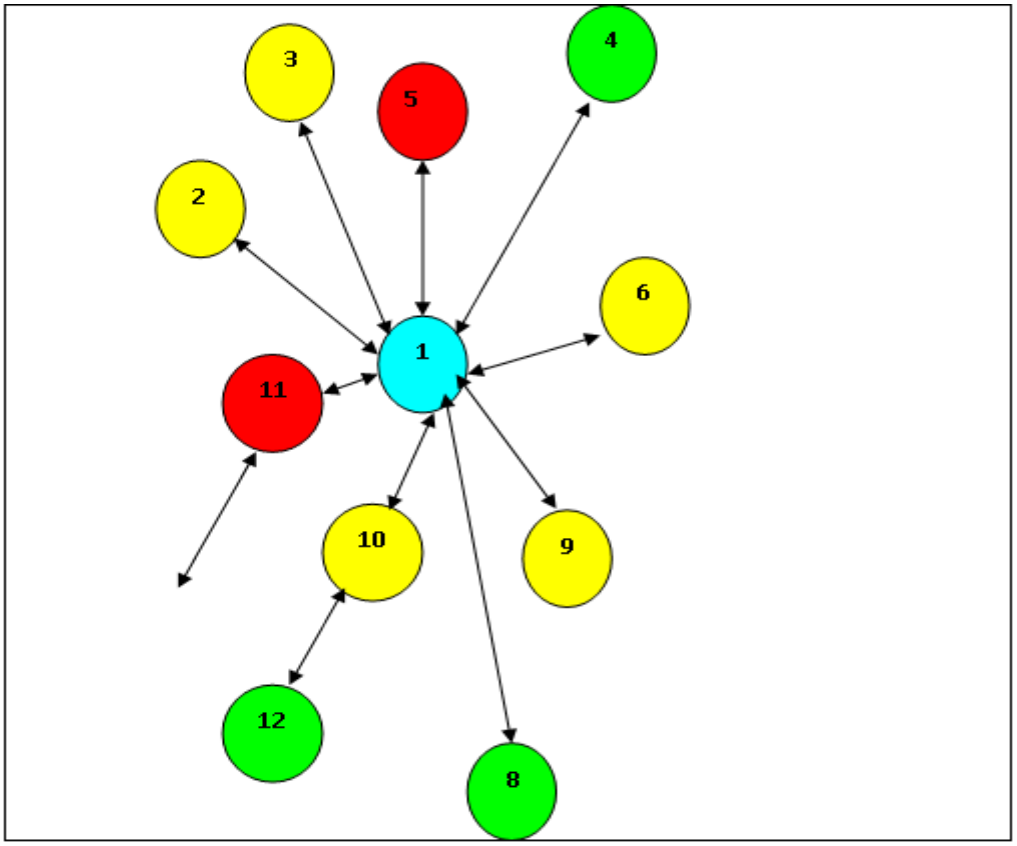

Fig 8 Working of the system

As shown in fig 5.7, If a car comes within 10m, it is indicated by a red color (warning signal) in the computer and then it will send braking signal to the corresponding car. If there are more than 8 cars means, piconet extends to scatter net.

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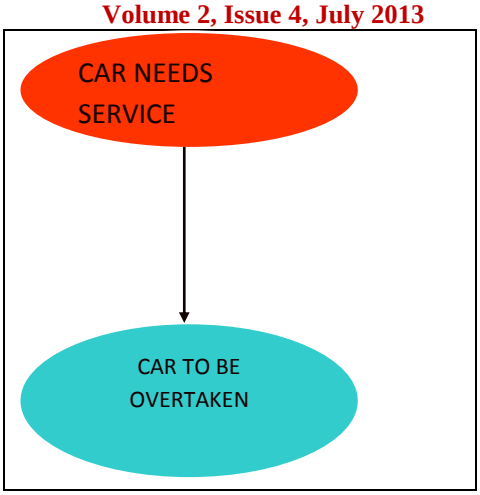

Fig 9: shows problem during overtaking and the solution

There is a problem during overtaking. This can be solved as follows. In the figure 5 the red car wants to overtake the blue car. The red car driver just touches the car in the computer that he wants to overtake. After receiving the signal, the blue car driver allows the red car to go, after the acknowledgement signal is given by the blue car to the red car when any car comes close together, Bluetooth device sends warning signal to the car. Based on the type of warning signal received, the computer sends signal to the brake control system to slow down the speed of the car. There are various types of control signals. One type of signal controls the speed of the car and the other type of control signal is to overtake the car which is moving forward. In case of a signal or traffic jam the user can just press the touch screen to let the minicomputer know about it.

VI. SCHEMATIC DIAGRAM OF CAR

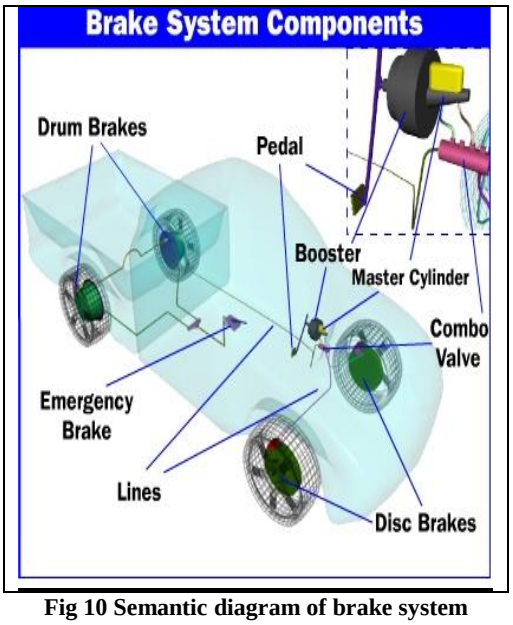

Fig 10 Semantic diagram of brake system

A. Automatic brake 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: [4]

- **speed sensors**
- **pump**
- **valves**

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- **controller**

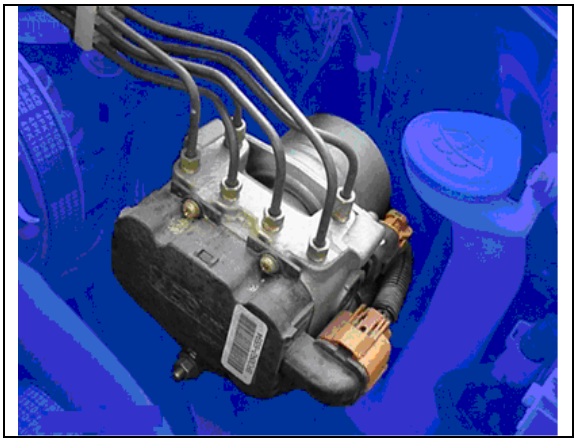

Fig 11 Automatic braking pump and valves

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 magnetised 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 is shown in the figure 9.

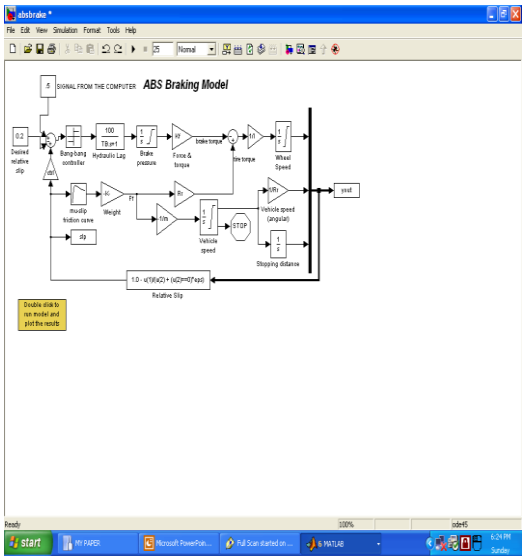

Fig 12– Mat lab simulation for the automatic braking system

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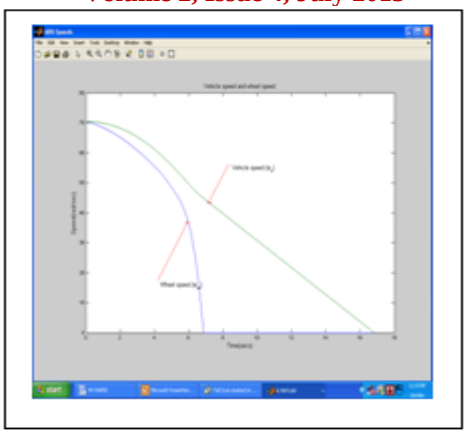

Fig 13 – Mat lab simulation for the automatic braking system not including

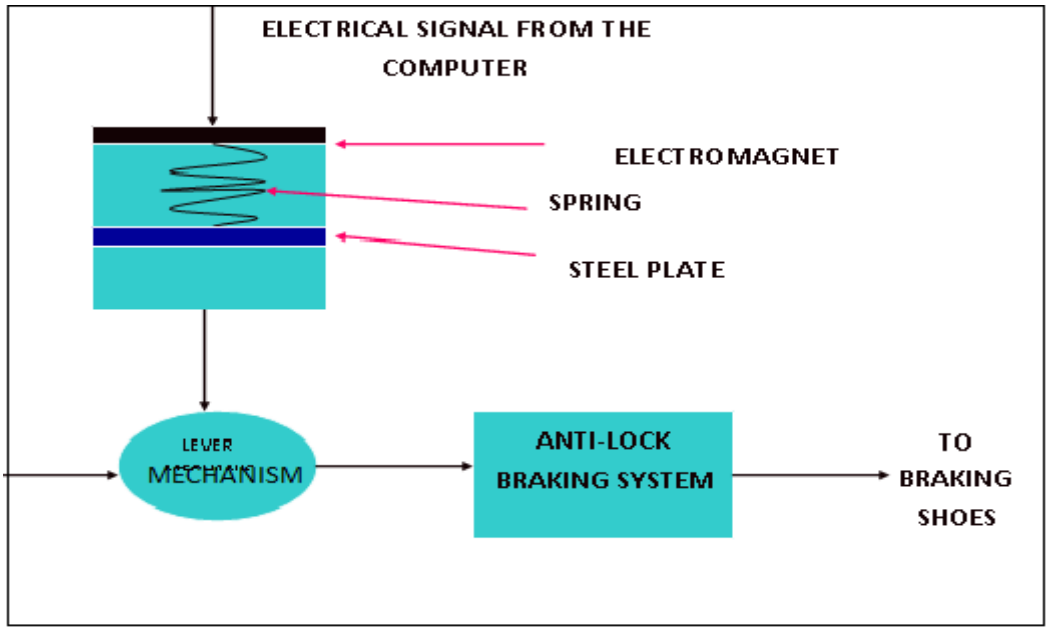

Fig 14 -Block diagram of automatic braking system

VII. QUESTIONS OF SECURITY

Since data is transferred over radio waves using Bluetooth, it is is much easier for a hacker to break into the secure wireless networks. Thus if this happens then anyone can tamper with the settings and this could lead to accidents. Solution: we can use various encryption algorithms in order to send the data which will provide security and act as an obstacle for hackers to tamper with the control of the car. Data Transfer Rate is the data sent between two Bluetooth devices has a maximum transfer speed of one megabyte per second. The slow transfer speed makes Bluetooth not an ideal choice for data transfer when faster connection methods are available. Solution: The data being transferred is approximately 1 megabyte so the speed is not a matter of concern. Moreover the driver will be signaled at an appropriate distance thus a delay of few seconds will not cause trouble.

A. Effect of climatic conditions on radio frequency

According to "IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, VOL. 27, NO. 9, DECEMBER 2009 1687
Weather Effects on Hybrid FSO/RF

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Volume 2, Issue 4, July 2013

Communication Link
Farukh Nadeem, Vaclav Kvicera, Muhammad Saleem Awan, Erich Leitgeb,
Sajid Sheikh Muhammad, Gorazd Kandus"
Using the free space optics along wit radio frequency the climatic effect can be reduced.
B.Drawbacks: All the cars should have this system in them.

VIII. CONCLUSION

The Bluetooth technology is being widely adopted by the Industry leaders. The possibility for new applications is very exciting with this versatile technology. It provides a simple logical answer to the entire problem, which built a single common radio into every mobile computer. Then companies have to worry about neither WAN nor building external cables. The Bluetooth communication device will thus be a small, low powered radio in a chip that will talk to other Bluetooth enabled products. Bluetooth has been designed to solve a number of connectivity problems experienced by the mobile workers & consumers. Thus, this technology is user friendly and helps address various other problems like accidents.

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AUTHOR BIOGRAPHY

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