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Vehicle Accident Prevention Using Assistant Braking System

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Abstract — Accidents occur mainly due to over speed, which results in lack of control of the vehicle and leads to accidents. We can prevent these kind of accidents by using a new kind of braking system which is known as assistant braking system. This assistant braking system uses laser triangulation sensor, PIR sensor and ultrasonic sensor as its main sensing components. With the help of these sensors, we can identify the obstacle and able to calculate the distance to them. PIR (Passive Infrared sensor) is also used to detect the presence of mammals and peoples in the path or track, and can able to calculate the distance. Using this distance we can manage the speed of the vehicle with the help of Assistant Braking System. This assistant breaking system automatically reduces the speed of the vehicle whenever it is necessary.
Keywords —Braking system, ABS, Accident prevention, PIR sensor, Laser triangulation sensor, safety;

I. INTRODUCTION

Four wheelers are the most sophisticated transportation in the fast developing world. The fast development leads into a rapid growth in automobile sector which increased the number of four wheelers to increase, in developed and developing countries as the result the risk in four wheeler transportation also increases. It is explained with a graph shown below.

50% of accidents occur in four wheelers. There are reasons behind these vast rates of accidents are lack of concentration, poor visibility, over speeding and failure to apply breaks at a right time. These are the major causes of accidents which occur in four

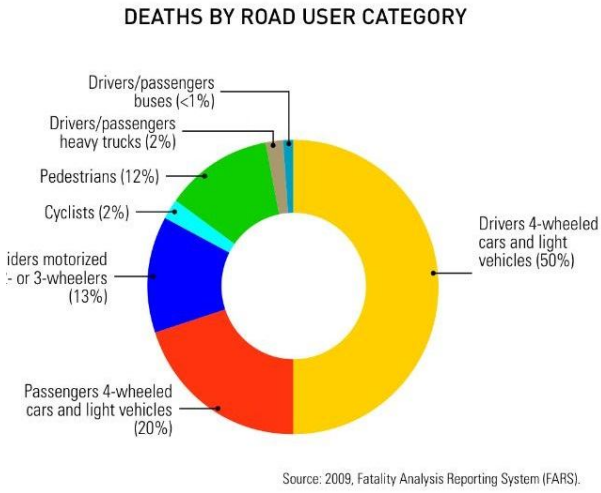

Fig 1. Statistical Report for death by road user category

wheelers. These kinds of accidents can be avoided by using a different kind of breaking system which is known as ASSISTANT BREAKING SYSTEM. It is a advanced and most sophisticated breaking system which uses obstacles identification and Digital image processing with this system we can identify the obstacles which is in front of us and which is far beyond us, using Digital image processing we can recognize the obstacles even in poor visibility. This system detects the safest distance between the obstacles based on the speed we are travelling and maintains the safest distance. Though these kinds of systems already exist in

higher end cars which a normal human could not offer, main motto of our system is to be implemented in every consumer car so that travel can be made safe and risk in travelling can be reduced.

II. SYSTEM OVERVIEW

Generally this system implies the new assisting model of assisting breaking system. This breaking system works by analyzing the input from many sensors like PIR sensor, Laser triangular sensor, Ultrasonic sensor and some assisting devices. This device takes input from these devices and analyzes the report and if any vehicles or obstacles found it will engage the breaking system automatically. The functional Block diagram of the system is shown below.

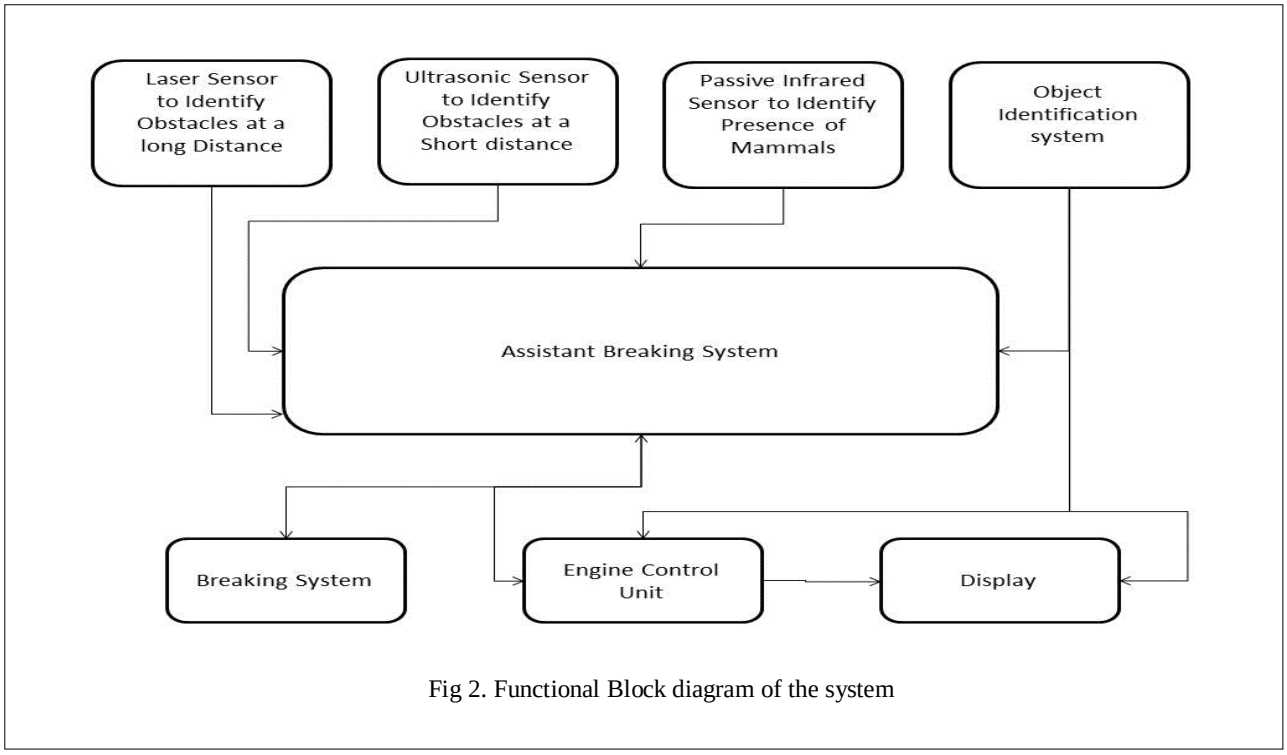

Fig 2. Functional Block diagram of the system

III. SYSTEM ARCHITECTURE

The construction of this system consists of two parts namely hardware development and software development. Hardware development involved the designing the circuit of the project while the software developments is focused on designing coding to be embedded in the hardware.

A. Hardware Developement

Brainwave and Alcohol Sensitizing Helmet includes several parts such as ARM Cortex-M3 Processor, Brainwave starter kit, Breath alcohol sensor, GPS locator, GSM/GPRS modem, microphone and Smart MP3 Player. ARM Cortex M3 microprocessor is the heart of this Smart helmet as it takes input from Neurosky headset, alcohol sensor and microphone and process the input and controls other system based on processed data.

1) Laser Triangulation Sensor: Laser triangulation sensors contain a solid-state laser light source and a PSD or CMOS/CCD detector. Laser diode sensors combine the alignment advantages of a visible sensing beam with the increased sensing range of a laser. It has a light sensor+lens next to the laser to detect the reflected dot when the beam is broken, so it can sense when the beam is broken from the starting location. There's no need for a matching end point sensor. It forms a good strong laser with a sensing distance of up to 1 meter. .

Fig 3. Laser Triangulation Sensor

A laser beam is projected on the target being measured and a portion of the beam is reflected through focusing optics onto a detector. As the target moves, the laser beam proportionally moves on the detector. CMOS and CCD type sensors detect the peak distribution of light quantity on a sensor pixel array to identify target position. CCD and CMOS systems are typically more accurate over a wider variety of surfaces because only the highest charged pixels from the reflected beam are used to calculate position. The lower charged pixels are usually energized by unwanted reflections from changing optical properties of the surface being measured and can easily be ignored during signal processing. This allows them to be used in this assistant breaking system.

2) Ultrasonic Sensor: Ultrasonic distance measuring sensors provide information on an absolute position of a target or moving object. Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo.

Fig 4. Long Range ultrosonic Sensors

The time elapsed between emitting and receiving is proportional to the distance of the object from the sensor. As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their colour. Even transparent materials or thin foils represent no problem for an ultrasonic sensor. Ultrasonic sensors are suitable for target distances from 20 mm to 10 m and as they measure the time of flight they can ascertain a measurement with pinpoint accuracy. Ultrasonic sensors can see through dust-laden air and ink mists. Even thin deposits on the sensor membrane do not impair its function.

IV. PIR SENSOR

PIR sensors are more complicated than many of the other sensors. A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIRs are basically made of a pyroelectric sensor which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves.

Fig 5. PIR Sensor

The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out.

A. Software Development

Software development is to develop embedded software required to control hardware development. It is the process of coding computer program which is needed to operate hardware development. The process flow for the working of the system is given with the help of flow chart.

The process flow of our vehicle accident prevention system has a concept of parallelism in which all the sensors senses simultaneously and the output is also processed simultaneously.

V. WORKING

The system of “Vehicle accident prevention system using assistant breaking system” uses multiple sensors that help to sense the environment. The laser triangulation sensor is used to identify the obstacles in long distance. For long distance Laser triangulation sensor is used as it has longer wavelength. If this sensor senses the obstacle it gives the auditory warning to the driver. At the same time short range sensor (sensor with shorter wavelength) i.e. ultrasonic sensor is used. If this ultrasonic sensor detects any obstacle, then it also gives auditory warning and it wait for some distance. If the speed is not reduced, the system will automatically reduce the vehicle speed. Similar operation is going to take place in case of PIR sensor also. PIR sensor helps to identify the presence of mammals in the vehicle path. In some case due to fog and heavy mist, we can’t able to have a clear vision. In case of vision bleach occurs the object identification system is powered on automatically. It consists of night vision camera, object analyzer and some similar components. It shows the surroundings in the monitor and with the help of this night driving mode, the driver can easily drive the vehicle with minimum number of ease.

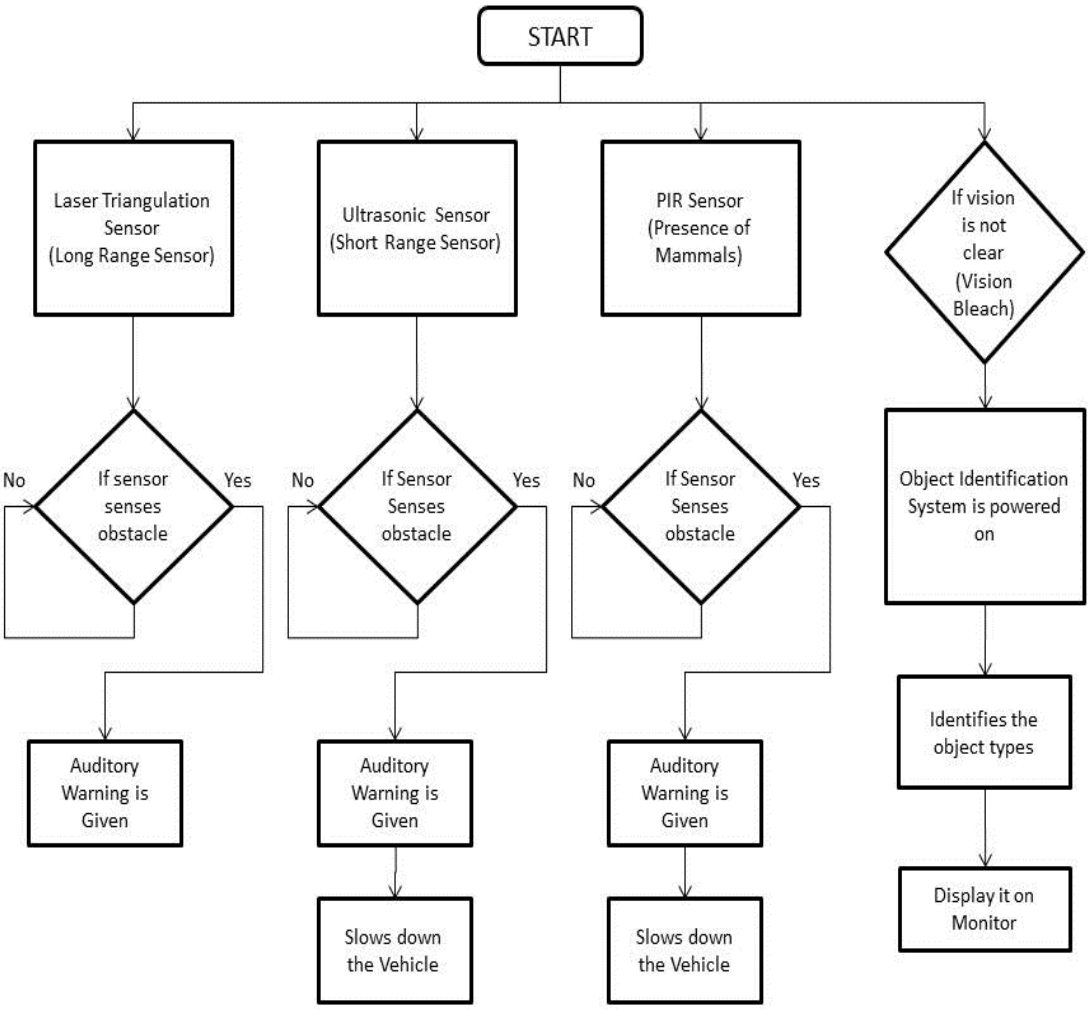

Fig 6. Flow chart for working of the system

VI. RESULTS

Thus with this system of Vehicle Accident Prevention System using assisting breaking system, significant amount of accidents can be reduced drastically. The overall control of the vehicle breaking system is under the control of surveillance system placed at it and also governs by the driver. The survey says that about 65% road accidents in car occur due to failure of applying break. Hence by using this system we can reduce the four wheeler accidents. This system also helps to drive the vehicle even during heavy mist and fog seasons as it has inbuilt Object identification system.

VII. CONCLUSION AND DISCUSSION

This system is available in higher end cars but aim of our model is to implement in all type of cars which are available on roads to make it travelling safer. So that this system becomes cost effective and can be available to all range of people and even for a lower end cars. Future implementation has to be done in almost all cars in India and other developing countries. It can also be implemented in railway systems, so that railway accidents can also be reduced.

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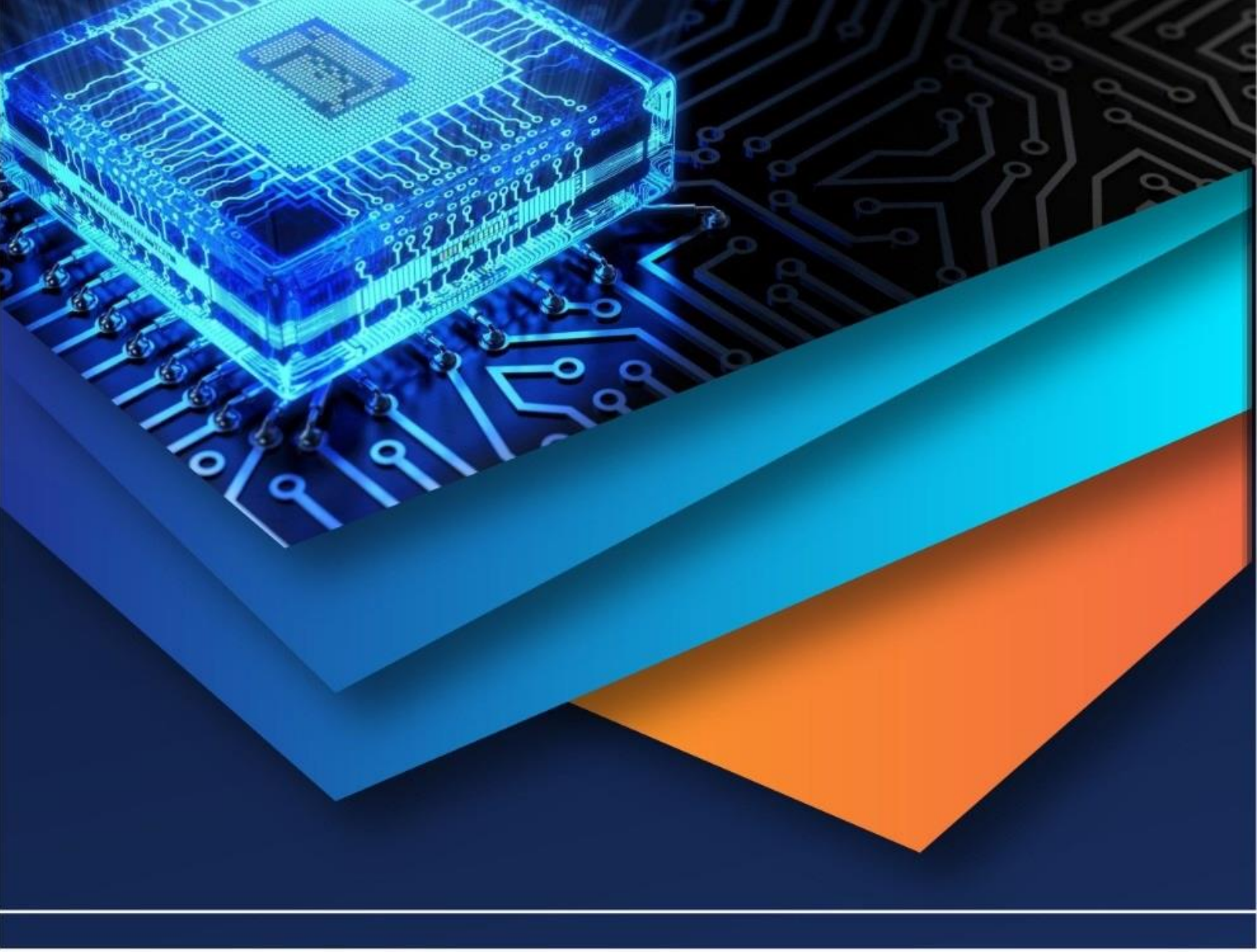

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