

# ACCIDENT AVOIDANCE SYSTEM USING IR SENSORS

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**Abstract** - The unavailability of assistive technology, guidance system and the lethargic activities of the drivers has caused a number of accidents over the past few years. The accidents can be controlled by the implementation of the technology from the field of pneumatics and mechatronics. To avoid accidents and to prevent collisions we propose "Accident avoidance system by using IR sensors". The system works by using the inputs from the IR sensors. It detects if the driver has fallen asleep by observing the eye blinks and sends pulses via the microcontroller. This activates the alarm and hazard lamps as the first level of safety. If the driver is still asleep the seat starts to vibrate. Eventually, the pneumatic bumper and braking unit gets activated and halts the vehicle. At this point the driver must have regained his senses, the automatic steering control is provided that turns the vehicle in the direction away from the hindrance and avoids collisions. This system is aimed to provide safety to the passengers and avoid accidents by detecting lethargic driving activity.

**Key Words:** Drowsiness, Accident Avoidance, Braking, IR sensor, Eye blink sensor.

## 1. INTRODUCTION

Drowsy driving is a major problem. The risk, danger, and often tragic results of drowsy driving are alarming. Drowsy driving is the dangerous combination of driving and sleepiness or fatigue. This usually happens when a driver has not slept enough, but it can also happen because of untreated sleep disorders, medications, drinking alcohol, or shift work. No one knows the exact moment when sleep comes over their body. Falling asleep at the wheel is clearly dangerous, but being sleepy affects your ability to drive safely even if you don't fall asleep. Drowsiness makes us less able to pay attention to the road, slows reaction time if you have to brake or steer suddenly and affects your ability to make good decisions. These ultimately leads to accidents on the roads.

### 1.1 TECHNOLOGY OF PNEUMATICS

Automation is the technology by which a process or procedure is performed with minimal human assistance. Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Automation has

been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination. Complicated systems, such as modern factories, airplanes and ships typically use all these combined techniques. The benefit of automation include labor savings, savings in electricity costs, savings in material costs, and improvements to quality, accuracy and precision. Automatic braking and bumper system that is incorporated in this work uses the principles of pneumatics and helps in achieving the braking process effectively.

### 1.2 PREVENTIVE TECHNIQUES

Sleeping is associated with the eyes of the driver. Drowsiness can be detected with the optical motion and the steering wheel movement. One of the methods for detecting eye blinking of the driver is by making use of IR sensor. The IR sensor is used to see the blinking of eyes of the driver. If the eyes are closed for certain period it will sense by IR sensor. The information of eye blink is send to microcontroller from IR sensor and makes the device work. Hence drowsiness of the driver is prevented and results in reduce percentage of accidents. Vehicle accidents are most common if the driving is inadequate. This work involves measuring and controls the eye blinking using IR sensor. The IR transmitter is used to transmit the infrared rays in our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed means the output of IR receiver is high other side the IR receiver output is low. This to know the eye is closing or opening Position. This output is given to circuit to indicate the alarm. After the indication of the alarm system, the vibration system is activated by use of the signals from the microcontroller. The processes are timed accordingly by programming the microcontroller. The alarm signal, vibration of the seat is used as a first level of safety to warn the driver and next the pneumatic braking and bumper is activated. In order to further avoid obstacles the automatic steering control is incorporated that rotates in the opposite direction of the collision. This is done by placing another IR sensor in the front and obtaining its signal pulses. The driver wakes up to control the steering and takes control of the vehicle thereby preventing the accident. An attempt has been made to develop an accident avoidance system using IR sensor in this work.

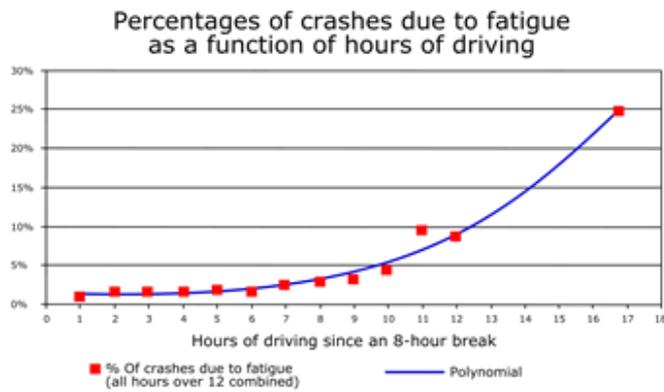


Chart -1: Percentages of crashes

## 2. ACCIDENT AVOIDANCE SYSTEM

The eye-blink sensor in this system is used to sense the eye blink of the driving person. It is an IR sensor. If the driver closes the eyes for more than 5 seconds the eye blink sensor senses it and sends the signal to the control unit, which receives the signal and activates the alarm pulses that causes the alarm signal as the first level of safety. The hazard lamps are turned on along with the alarm to indicate the commotion to the other vehicles around.

If the driver has his eyes closed even after the alarm signals the vibration system is activated which causes the vibration of the seat. This acts as the second level of safety. If the driver has awoken from his sleep by this time, all the sequence of operations are terminated and the driver takes control of the wheel. On the contrary, the eyes are still closed the third level of safety comes into action.

The third level of safety comprises of the pneumatic braking and bumper system eventually followed by the automatic steering control. In this work, pneumatic braking and bumper arrangement is applied in one wheel as a model. The compressed air drawn from the compressor. The compressed air flows through the polyurethane tube to the flow control valve. The flow control valve is connected to the solenoid valve as mentioned in the diagram. After the successful application of pneumatic braking and bumper protrusion the driver tries to stop the vehicle from crashing. In order to provide additional level of safety the automatic steering control is employed that makes the steering rotate in the opposite direction of the hindrance based on the input signal received from the IR sensor placed in the front of the frame thus avoiding the obstacle and providing safety to the travelers. The driver at this point gains control over the vehicle and steers it into safety.

This is the working mechanism of accident avoidance system using IR sensors.

## 3. IMPLEMENTATION OF THE PROPOSED SYSTEM

Due to the importance of early detection of driver fatigue and drowsiness to avoid accidents, researches were done on this subject and the accident avoidance system was formulated. The earlier developments on the methods for driver distraction detection are also being done, but are less

developed than the methods of driver fatigue detection. However, fatigue and distraction can be considered as two separate concepts, since both of these factors reduce driver alertness; both categories are investigated. The accident avoidance system can be used to detect the drowsiness of the driver based on the optical movements or eye blinks. The proposed system combines mechatronics with IR sensor monitoring to detect driver drowsiness and controls the car using the accident preventive measures incorporated in the system.

The statistics of road and current driver condition by behavioral measuring techniques have mainly focused on the analysis of eye closure and blinking of the driver. In this work humans and animals are prioritized first and then obstacles. The system first tries to get the driver back to his senses by the alarm signals and vibration of the seat. If the system is unable to do this the next level of safety comes into action. IR Sensors used to detect the obstacles while travelling on car. It has some limited range of 10mtrs.

The proposed work can be implemented in heavy duty trucks that is used for transportation of goods over long distances. In the present cases, accidents are caused by the drivers driving the trucks during the day and night as a part of the logistics. They tend to get exhausted due to the continuous work load and are unable to take proper rest. They are under pressure to deliver the goods at the stipulated time. This leads to the drowsy diving of the driver due to lack of rest. This accident avoidance system can be incorporated in these areas.

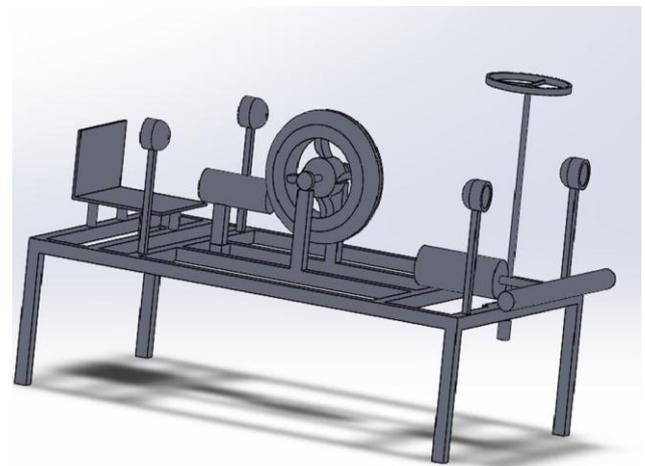


Fig -1: Accident avoidance system

## 4. RESULTS OF THE SYSTEM

The accident avoidance system uses the alarm pulses and vibration system as the first level of safety. This has made the driver to gain his senses back and snap out of drowsiness.

The hazard lamps that gets impulses along with the alarm has been used to warn the other vehicle drivers and increases attentiveness. The hazard lamps can be visible during the fog and mist conditions.

The accident avoidance system uses the pneumatic braking and bumping system that has its own advantages of reducing the speed of the vehicle and bringing it to rest position. The bumper reduces the frontal impact of the vehicle during collision. This system aims at providing safety and protection to the driver and travelers thereby reducing accidents.

The microcontroller incorporated in accident avoidance system sequences the series of operations and executes the operations periodically. This fast interactive response of the microcontroller has reduced the time and the occurrence of accidents.

## 5. CONCLUSIONS

In this work, the “Accident avoidance system using IR sensor” has been successfully developed and tested. This work has proposed a design and implementation of accident prevention using eye blink sensor with microcontroller successfully. The following conclusions were made from this work:

1. Integrating the features of the microcontroller and the mechanical actuation system the accident avoidance system serves as a system for prevention of accidents.
2. The accident avoidance system provides first, second and third level of safety based on the drowsiness and the intensity of the collisions.
3. The automatic steering control incorporated serves as an additional system to avoid collision.

The developed accident avoidance system aims at providing safety to the driver and travelers thereby preventing from accidents and collision to meet the objective “Prevention is better than cure”.

## REFERENCES

- [1] “PIR based wireless sensor node prototype for Surveillance Application”, Piero Zappi, Elisabetta Farella, Luca Benini, July 2010.
- [2] “Accident Prevention and Reporting System using GSM (SIM 900D) and GPS (NMEA 0183” (2014), Rashida Nazir, Ayesha Tari, Sadia Murrawat, Sajjad Rabbani .
- [3] “Proposal for an IR System to support an Automatic control for a Personally Mobility Vehicle”, Taro Fujikawa, Shuro Nakajima, International Conference on Robotics and Biomimetics-IEEE, DOI:10.1299/jsmeltd.2012.21.245.
- [4] “Automatic Braking with Pneumatic Bumper System”, Katore S.R., Kadlag S.C., Mane P.V., Pawar G.V., Prof. Londhe B.C., International Journal of Engineering Education and Technology, Vol 3, Issue 2, April 2015.
- [5] “Study of Rear-end Crashes and Head Injuries”, Prof. Katherine Shaver, Journal of Traffic Injury Prevention, Oct 2018.
- [6] “Automatic Pneumatic Bumper System”, Aditya Pratap Singh, Ayush Saroy, Gaurav Harit, Avinash Jaiswal, Pankul Goel, International Journal of Advance Research and Innovative Ideas in Education(IJARIIE),Vol-4, Issue-3, 2018 pp1048-1052