

# DESIGN AND FABRICATION OF AUTOMATIC BRAKING SYSTEM USING IR SENSOR

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## ABSTRACT

*Now-a-days, there are perceptible road accidents occurring due to many reason. Carelessness of the driver is one of the reason for accident particularly during the night the main objective is to design a braking system, which gives alarm to the driver and also vibrate the seat of the vehicle at the back and also apply brake of the vehicle. The accident occurred caused by drowsy and when the driver wakes up he can't be able to control the vehicle. The drowsiness is indented by the eye blink closure and blinking frequency through infrared sensor worn by the driver by means of spectacles frame or IRs. If the driver is drowsy then the system will give buzzer and the speed of vehicle reduced in 3 seconds. Also accelerometer sensor is mounted on spectacles frame for measuring and tilt angle. The advantage of this project is to minimize number of accident.*

**Keywords:** - Arduino, Relay, IR Sensor, Accelerometer, Buzzer, Vibrator Motor, Limit switch.

## 1. INTRODUCTION

The drowsiness (a feeling of being sleepy) is one of the reasons responsible for the vehicle accidents. Around 30 percent accidents are occurs due to drowsiness of the driver. The driver drowsiness can be detected by checking driver response. 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 Arduino Board 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. These happen on most factors if the driver is sleeping or if he is alcoholic.

This project involves measure 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. This project involves controlling accident due to unconscious through eye blink. Here one eye blink sensor is in vehicle where if anybody loses conscious and indicate through alarm. Then eye blinking sensor transfer signals to the Arduino and then to relay and the power of dc motor is cut off dc motor, which apply the brake and vehicle will be stopped gradually in 3 sec.

## 2. LITERATURE REVIEW

Literature Review is implemented to carry out to acquire knowledge and skills needed to complete this project. The main sources that led us built this system are previous projects and various thesis related to this project. And other source is Internet wherein we referred various international journals. Thus, by referring to previous project, we can figure out the disadvantages in their project or what we can modify in their system. Information about various reference papers or previously implemented project have been used as a reference which is as discussed below:

In [1] Uses advanced MCU to detect the fatigue symptoms & sends an electric O/P signal to motors which thereby reduces speed of vehicle & avoids any mishap.

In [2] Have used the toolkit having photosensitive distance sensors on front & back continuously tracks moments of surrounding which in turn registers down I/P to ECU & In case of Sudden Frontal deceleration it stops the subject car as well as alerts the car coming from backside using LED backlight.

In [3] Have developed the GPS module embedded in the kit which creates a virtual trail map for keeping track of the subject, while the alcohol & IR sensor monitors the health & fatigueness of the driver. The temperature sensor tracks engine runtime and decides whether the driver is need of some rest.

In [4] Have used an embedded system completely separated from mechanical component of car is setup to detect & infuse down a direct signal to the back seat passengers as well as driver alerting that he is not in the condition to drive the car perfectly.

In [5] Have demonstrated system which works when the driver closes the eye around 3-5 seconds. The IR sensor senses the eye blink of the driver and it gives data to the microcontroller and the brake applied gradually

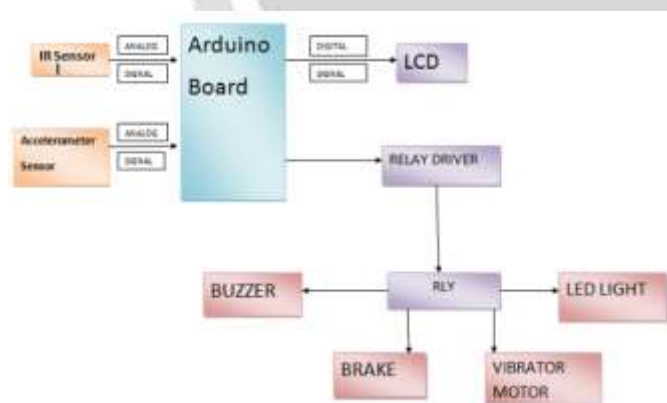
In [6] Have used The IR sensor gives the information to the timer circuit, it activates the microcontroller and it give the information to the three relays from this three relays the brake will be applied according to intensity of I/P received.

### 3. WORKING PRINCIPLE

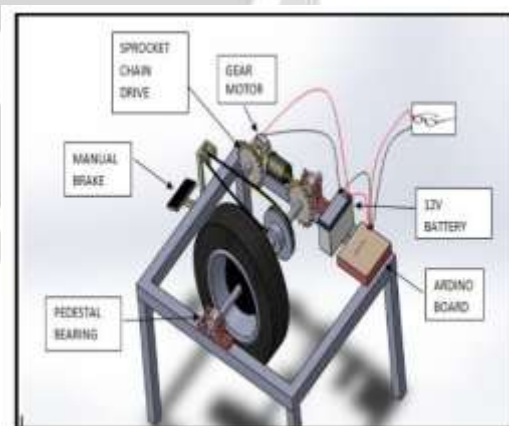
In this eye blink detection sensor used by us is to see the blinking of eyes of a person driving the car. This will not recognize the normal flashing of eyes but will provide the time period for it, so that it will detect after the given time period. If the eyes are closed for 3sec it will be sensed by IR sensor and this signal is further send to Arduino Board. The intensity of IR light and time for closed position of eyes can made adjustable according to the distance of sensor from the eyes.

The accelerometer sensor is used to detect the head inclination angle if the head is inclined for more than 45 degree for 1.5 seconds it is programmed for actuating braking system and buzzer.

**Fig 1: Block Diagram of system**



**Fig 2: Constructional diagram**



The braking system has a tyre in which it rotate in its axis by using dc geared motor and a dc braking system which works according to the working of the command of the Arduino. The whole assembly is mounted on a frame.

There are four relays one for the disconnecting the driving motor and another for the braking circuit running purpose.

If the driver is seen to be drowsy i.e. the eyes of drivers are closed for 3 seconds and if the head is inclined for more than 45 degrees for 1.5seconds then the IR sensor and accelerometer sensor gives the information to the timer

circuit, it activates the Arduino and Arduino gives information to four relays. Accordingly the buzzer will make noise and at the same time the driving motor will be disconnected by disconnecting the relay and motor used for braking will be on through relay. This is how the project works.

### 3.1 Component Used

#### A) Eyeblink Sensor:

The eye blink sensor consists of an Infrared Transmitter and a Receiver. The infrared transmitter transmits the rays and the receiver receives the rays. The sensors sense our reaction of the eye (closed or opened) for 3 sec and gives information to the system that is the timer circuit. The timer circuit then proceeds the information to the Arduino board.

#### Specification:

- Detection Range : 2cm to 30cm
- Detection angle : 35°
- Operating Voltage range : 3.3V to 5V
- 3mm Diameter hole for easy mounting

#### Eyeblink Sensor



Fig 3:

#### B) Accelerometer Sensor:

The accelerometer sensor is used to detect the head inclination angle if the head is inclined for more than 45 degree for 3 seconds it is programmed to actuate braking system and buzzer.

#### Specification:

- ADXL335 Module (triaxial accelerometer analog output)
- Power supply :3-5v
- Analog x, y, z three-axis output direct output
- Full-scale range of  $\pm 3$  g
- BW adjustment with a single capacitor per axis
- Rohs/Weee Lead-free compliant
- Size : 4× 4× 1.45 mm
- Low power : 350  $\mu$ a (typical)

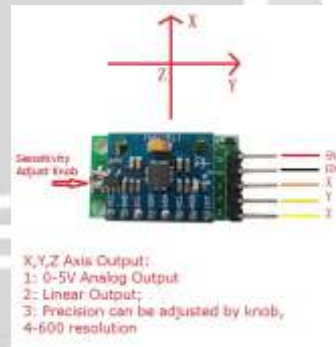


Fig 4.

#### Accelerometer Sensor

#### C) Gear Motor:

The DC Gear Motor is used to drive the wheel. It provides low rotational output speed to create incredible amount of torque.

#### Specification:

- 24V Capacity
- 40 RPM.
- Power 30 Watt



Fig 5: Gear Motor

**D) Pedestal Bearing:**

A pillow block usually refers to a housing with an included anti-friction bearing. A pillow block refers to any mounted bearing wherein the mounted shaft as in a parallel plane to the mounting surface and perpendicular to the center line of the mounting holes as contrasted with various types of flange blocks. A pillow may contain a bearing with various types of rolling element. E.g. Ball, roller, cylindrical, tapered, needle type etc.

**E) Four Way Relay:**

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. This module is designed to be integrated with 4 relays that it is capable of control 4 relays. The relay output state is individually indicated by a light-emitting diode.

**Specification:**

- Number of Relays: 4
- Control signal: TTL level
- Rated load: 7A/240VAC 10A/125VAC 10A/28VDC
- Contact action time: 10ms/5ms

**Fig 6: Four Way Relay****F) Arduino**

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on processing.

**Specification:**

- Microcontroller ATmega328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader.

**Fig 7 : Arduino Board****3.2 Braking Mechanism Used**

The manual braking mechanism used is similar to the one which is shown below.



**BRAKE ON**  
**Fig 8: Braking Mechanism**



#### 4. CONCLUSIONS

Actually the fact is that the driver is not able to control when he is asleep and by the time he realizes it, there is an accident. The car at very high speed is very difficult to control and getting the vehicle to halt under such condition is very risky. In this project we will generate a model in which can prevent such an accident. The purpose of such model is to advance a system to detect fatigue symptoms in drivers and control the speed of vehicle to prevent the accidents and prevention of any life hazards.

The components in this system are revised and checked for proper working of the system and all the components are working. The torque of the motor is calculated electronic part is checked. The above results and works shows that present design is the best and accident alarm indicator and braking is working good according to the eye blink closure and opening of the driver is successful.

#### 5. ACKNOWLEDGEMENT

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