Driver Accident Prevention System

Nikhil Pandey[1], Suniti Purbey[2]
[1]*Student, Amity Institute of Information Technology, Raipur*
[2]*Assistant Professor, Amity Institute of Information Technology, Raipur*

***Abstract*— Nowadays accident caused by the sleepiness of the driver is very common. When a driver feels drowsy, he/she loses concentration on the road or driving or the vehicle coming from the front, which leads to accidents, which cause severe injuries or ultimately death. The main cause of feeling sleepy while driving is fatigue, a busy schedule or an irregular sleep cycle. By the above analogy, we can say that lack of attention or drowsiness may lead to severe accidents. To reduce the risk of accidents we need a device that can track the driver's activity while driving and alert the driver on time so that he/she can take accurate action if the alerting the driver does not work the system should take accurate steps automatically to ensure the proper safety of the driver. With this device, we can reduce the cases of accident that happens especially due to sleeping on the river while driving.**

Index Terms: **Drowsiness, Eye-blink sensor, Arduino, Vehicle.**

I.INTRODUCTION

A Sleeping while driving may lead to a very high risk of accidents. In particular, Klauer et al. [1] have shown that driving while feeling drowsy raises the risk of accidents auto 4 -6 times when compared with alert driving. And adding to it the risk is even more while driving at low light or in at the night. Approximately 15 – 20 % of all accidents are caused by driver drowsiness.

It is well proved that signs of sleepiness can be found in physiological signals, particularly the signals of brain activity, obtained through electroencephalography (EEG) [2]. And eye-ball movements, obtained through electrooculography (EOG) [3].To prevent the accidents caused especially because of drowsy driving, or sleepiness I have designed a goggle that will track the movement of the eye and if the driver will be feeling sleepy the sensors attached to it will take accurate measures. By using these goggles, the driver can be alerted instantly and prevent a lot of accidents and fatalities.

II.METHODOLOGY

The items used and their working principle is as follows:

A. IR Sensor:

An IR sensor is a device that releases the lights to sensor some objects in the surroundings. It can calculate the heat of an item as well as detectits movements. Usually, all objects radiate some form of thermal radiation in the infrared spectrum. This radiation is not visible through our naked eyes., but an Infrared sensor can detect it. It works on the very basic mechanism that is, The emitter i.e. Simply an IR LED and the detector is simply an IR photodiode. The photodiode is very sensitive to IR light of the same wavelength which is released by IR LED. When the IR light encounters the photodiode, the resistance, and the output voltages will change in proportion to the magnitude of IR light received.[4]

Five parts are used in a typical IR detection system: an IR source, a transmission medium, an optical component, infrared detectors or receivers and signal processing. Infrared LEDs are used as an infrared source. An IR sensor is also used in the detection of movements of a particular object (Eyes in our case).

B. ARDUINO UNO

Arduino UNO is the microcontroller basedon ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, and an ICSP header and a reset button. It contains almost every element needed to support a microcontroller. We can say that it acts as a brain of a project [5].

C. PIEZO BUZZER

PA piezo buzzer is a device commonly used to produce sound. Lightweight, simple architecture and super affordability make it usable in various applications like alarm systems, indicators etc. It is based on the inverse principle of piezoelectricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomenon of generating electricity when mechanical pressure is applied to a certain material and the opposite is also true. Such material are as are commonly known as piezoelectric materials. [6] A usual buzzer consists of a resister, a transistor and an inductor. The input to the transducer is a low voltage DC signal, however, to produce sound, the piezoceramic disc needs an oscillation of high voltage. The transistor and resistor combination works as an oscillator circuit to produce low amplitude oscillations from the DC voltage. And its magnitude is amplified by the inductor.

D. WORKING ON IR SENSOR IN OUR PROJECT

In our project, the IR transmitter and receiver should be in a straight line for optimum performance. The transmitter sends IR rays into our eyes and then according to the condition whether the eyes are opened or closed it will give high or low output accordingly. The sent signals are captured by the IR receiver. This receiver is connected to the comparator. The comparator is an op-amp where the reference voltage is given to inverting input terminal and the output of the receiver is given to the non-inverting terminal.

III.LITERATURE SURVEY

A. In 2008, Hong Susu et al. [7] described ‘a partial least squares, regression-based fusion Model, for predicting trends in drowsiness’. They suggested a new method of shaping driver drowsiness with multiple eyelid movement features based on the data fusion technique – partial least square regression (PLSR), with which to cope with the problem of strong collinear relations among eyelid movements features and thus predicting the tendency of the drowsiness. The prediction accuracy and reliability of the model thus established are validated, which depicts that it provides a novel way of fusing multi-feature for improving the capability of finding out and predicting the state of drowsiness.

B. In 2011, M.J. Flores et. Al. [8] described a ‘Driver drowsiness detection system under infrared illumination for an intelligent vehicle’. They suggested that to reduce such an amount of accidents, a module for an advanced driver assistance system, which serves for automatic drowsiness detection and also driver distraction, be presented. AI algos. Are used to process the visual information to examine both driver’s face and eyes to compute sleepiness and distraction indexes.

C. In June 2014, Eyosiyas et. Al. [9] described in ‘Driver Drowsiness Detection through \HMM bases Dynamic modelling’. They proposed a new method of analyzing the facial expressions of the driver through the Hidden Markov Model (HMM) based dynamic modelling to detect drowsiness. They applied the algo using a simulating driving setup. Experimental results proved the usefulness of the proposed method.

D. In 2013, G. Kong et. Al. [10] described ‘Visual Analysis of Eye state and head Pose for Driver alertness Monitoring’. They suggested visual examination of eye state and head pose (HP) for non-stop monitoring of attentiveness of driver. Most of the previous technological approaches to visual detection of non-attentive driving patterns rely either on eye closure or head-nodding angles to decide the driver’s sleepiness or distraction levels. The suggested scheme uses visual features such as eye index (EI), pupil activity(PA), and HP to extract critical information about the non-attentiveness of drivers.

E. Jemai et al. [11] proposed a method for a sleepy warning system using wavelet networking. That network tracks eye movement with certain algorithms such as Wavelet Network Classifier(WNC) that works on Fast Wavelet Transform(FWT), which specifically leads to binary way decision(Sleepy or Not). The physiological part isheartbeat rate and electrocardiogram that are repeatedly extracted bb the wavelet transformation with regression technique for drowsy detection, designed by Babaeian et al. [12]. This formula worked on heart rate data classification by wavelet network which can find an average way of sleepiness alert system.

F. Arefnezhadet al.[13] suggested a non-disturbing drowsy detection system based on vehicle steering data by applying a neuro-fuzzy system with a support vector machine and particle swarm optimization technique. Mutya et al. [14] proved a system to resolve the problem of sleepiness using a steering wheel algorithm. It is simply based on the mage formed or pictorial-based steering movement and the CNN algorithm for determining the proper type of drowsiness, which can also reduce the false sleepy detection rate.

IV.BLOCK DIAGRAM OF PROJECT AND WORKING

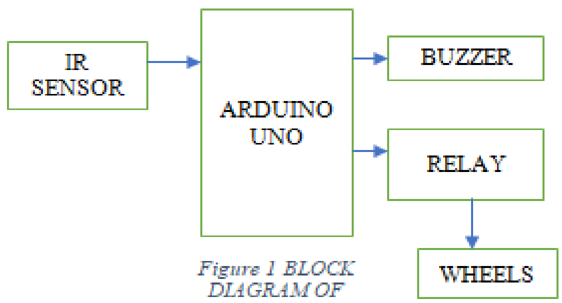
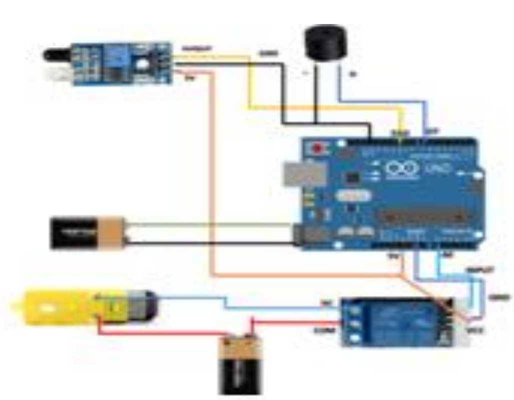


Figure 1 BLOCK DIAGRAM OF PROJECT

As shown in fig. In our project, the driver will wear our IR sensor embedded glasses/goggles which will track the movement of the eyelid and eye. And when the driver will close his eyes for more than 2 seconds the sensor will send signals to Arduino Uno that the driver is sleeping or feeling drowsy then the Arduino will turn on the buzzer so that driver could be alerted on time through the noise generated by piezo buzzer but when the driver doesn’t open his/her eyes for more than 2 seconds extra (after buzzer is activated) the Arduino will send a signal to wheels of the car to stop the car (also turning on left indicator) so that life of driver can be saved.

V.CIRCUIT DIAGRAM OF PROTOTYPE



VI. CONCLUSION

The paper provides a robust method for detecting the drowsiness of drivers. This proposal not only detect and alert the driver but also takes necessary actions if the driver is still not awake. This project is made by keeping in mind the previous works done in this field. By using my project the driver will feel safe while driving and this project will also help reduce the accidents especially caused by sleeping while driving. But still, the driver needs to take care of his sleep cycle and avoid fatigue while driving as much as possible. Drivers should drink a lot of water and also take regular rest while long driving. We made this project for ensuring the utmost safety of a driver by not only alerting him/her but also stopping the vehicle when the driver is not awake for long period.

REFERENCES

[1] S. G. Klauer, T. A. Dingus, V. L. Neale and J. D. Sudweeks, "The impact of driver inattention on near-crash/crash risk: An analysis using the 100-car naturalistic driving study data", U.S. Dept. Transp. Nat. Highway Traffic Safety Admin. DC DOT HS, vol. 810, 2006.

[2] J. van den Berg, Indicators and predictors of sleepiness, 2006.

[3] P. Caffier, U. Erdmann and P. Ullsperger, "Experimental evaluation of eye-blink parameters as a drowsiness measure", Eur. J. Appl. Physiol., vol. 89, no. 3/4, pp. 319-325, May 2003.

[4] https://robu.in/ir-sensor-working/

[5] https://docs.arduino.cc/hardware/uno-rev3

[6] Ashutosh Bhatt, https://www.engineersgarage.com/insight-how-piezo-buzzer-works/

[7] Hong Su and Gangtie Zheng, “A Partial Least Squares Regression-Based Fusion Model for Predicting the Trend in Drowsiness” IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART A: SYSTEMS AND HUMANS, VOL. 38, NO. 5, SEPTEMBER 2008.

[8] M.J. Flores J. Ma Armingol A. de la Escalera, “Driver drowsiness detection system under infrared illumination for an intelligent vehicle” Published in IET Intelligent Transport Systems

Received on 13th October 2009 Revised on 1st April 2011.

[9] Eyosiyas Tadesse, Weihua Sheng, Meiqin Liu," Driver Drowsiness Detection through HMM-based Dynamic Modeling." 2014 IEEE International Conference on Robotics & Automation (ICRA) Hong Kong Convention and Exhibition Center May 31 - June 7, 2014. Hong Kong, China.

[10] Ralph OyiniMbouna, Seong G. Kong, Senior Member, IEEE, and Myung-Geun Chun," Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring." IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 14, NO. 3, SEPTEMBER 2013.

[11] O. Jemai, I. Teyeb, and T. Bouchrika, "A novel approach for drowsy driver detection using eyes recognition system based on wavelet network," International Journal of Recent Contributions from Engineering, Science & IT, vol. 1, no. 1, pp. 46–52, 2013.View at: Publisher Site | Google Scholar.

[12] M. Babaeian, K. A. Francis, K. Dajani, and M. Mozumdar, "Real-time driver drowsiness detection using wavelet transform and ensemble logistic regression," International Journal of Intelligent Transportation Systems Research, vol. 17, no. 3, pp. 212–222, 2019.View at: Publisher Site | Google Scholar

[13] S. Arefnezhad, S. Samiee, A. Eichberger, and A. Nahvi, "Driver drowsiness detection based on steering wheel data applying adaptive neuro-fuzzy feature selection," Sensors, vol. 19, no. 4, p. 943, 2019.View at: Publisher Site | Google Scholar

[14] K. Mutya, J. Shah, A. D. McDonald, and J. Jefferson, "What are steering pictures are worth? using image-based steering features to detect drowsiness on rural roads," Proceedings of the Human Factors and Ergonomics Society Annual Meeting, vol. 63, no. 1, pp. 2041–2045, 2019.View at: Publisher Site | Google Scholar