DRIVER DROWSINESS DETECTION AND ALERTING SYSTEM BASED ON ARDUINO

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Abstract

In this paper Arduino nano is used to detect the driver drowsiness with an alerting system. As driver drowsiness is the most frequently caused for the terrible traffic accidents thus drowsiness detection plays a world-shaking role to avoid the traffic accidents. So, by developing self-executing solution for alerting drivers of drowsing, before an accident occurs. So that we can reduce the more number of traffic accidents. Therefore, this research proposes a real time detection approach for driver drowsiness. The proposed approach has two phases: transmitter and receiver consists of Arduino nano.The exact functionality depends on the positioning and aiming of the emitter and detector with respect to the eye. The sensor is connected with Arduino nano. If the result of the classification indicates that the driver's eyes is closed for a predefined period of time, the eyes of the driver will be considered closed and hence an alarm will be started to alert the driver. The proposed methodology has been tested on available benchmark data. The result demonstrates the accuracy and robustness of the hybridized of image of eye detection processing technique with Arduino technique. Thus, it can be concluded that the proposed approach is an effective solution method for a real-time of driver drowsiness detection.

Keywords: Drowsiness, Arduino nano, Transmitter, Receiver.

1.Introduction

Road accidents became a matter of concern due to the huge increase in traffic. The primary cause of accidents is due to the drowsiness of drivers in the night time. Fatigue and drowsiness are some of the leading causes of major accidents on Highways. The only solution to this problem is detecting the drowsiness and alerting the driver. So, in this project, we have thought of building a Driver Drowsiness Detection and Alerting System for Drivers using Arduino Nano, Eye blink Sensor, and RF Transceiver module. The basic purpose of this system is to track the driver's eye movements using Eye blink Sensor and if the driver is feeling drowsy, then the system will trigger a warning message using a loud buzzer alert.

The number of road accidents caused by drowsiness drivers was 1,643 in 2018.Hence in order the reduce the accidents due to drowsiness and alcohol consumption can be reduced by using the eye blink sensor and alcohol sensor respectively. Hence when they are detected the speed of the car slows down and stop which avoids the rash driving. Accidents due to driver drowsiness can be prevented using eye blink sensors. The driver is supposed to wear the eye blink sensor frame throughout the course of driving and blink has to be for a couple of seconds to detect drowsiness. The eye-blink sensor works by illuminating the eye and eyelid area with infrared light, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit. The exact functionality depends greatly on the positioning and aiming of the emitter and detector with respect to the eye. The sensor is connected with Arduino nano.

The author in this paper is Suganiya Murugan,[1] were researches on 1st feb 2020 on infrared camera based monitoring of the hypovigilance(normal,fatigue,drowsy) which is nothing but the monitoring the state of the driver during different timings of the day. The author in this paper is Jerrita Selvaraj[2] were researches on 1st march 2019 on analysis of different measures to detect driver states based on the Advanced Driver Assistance System(ADAS) to avoid death, injuries, or economic losses during terrible accidents. The author in this paper is Arun Sahayadhas[3] were researches on 1st feb 2021.So, the aim of this paper is to analyze the Electroencephalogram(EEG) signals to detect the distractive driving. The author in this paper is S. Pradeep Kumar [4] were researches on 1st march 2019 were comparatively studied on the different measures to identify driver states which are also called as hybrid measures. The author in this paper are ward Vanlaar, Herb Simpson, Dan Mayhew[5] were published on february 2008, about fatigued and drowsy driving:

A survey of attitudes, opinions and behaviors. They finally results by indicating that relatively ineffective measures such as opening the window or playing the music. The author in this paper are Allan I.Pack, Andrew M. Pack, Eric A Rodgman[6] were published on January 1996 about the characteristics of crashes attributed to the driver having fallen asleep. The author in this paper are H.Ueno, M.Kaneda, M.Tsukino [7] have developed a system that uses image processing technology to analyze images of the driver's face taken with a video camera. Diminished alertness is detected on the basis of the degree to which the driver's eyes are open or closed. This detection system provides a noncontact technique for judging various levels of driver alertness and facilitates early detection of a decline in alertness during driving.
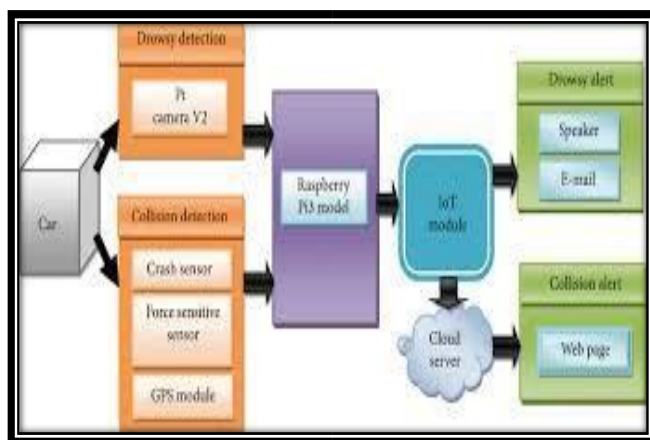
Fig.1. Drowsiness detection based on IOT

As the above fig.1. represents the flow chart from car ›Drowsy detection ›Raspberry Pi model › IOT model› Drowsy alert. So this is the another method of detection of drowsiness based on IOT.
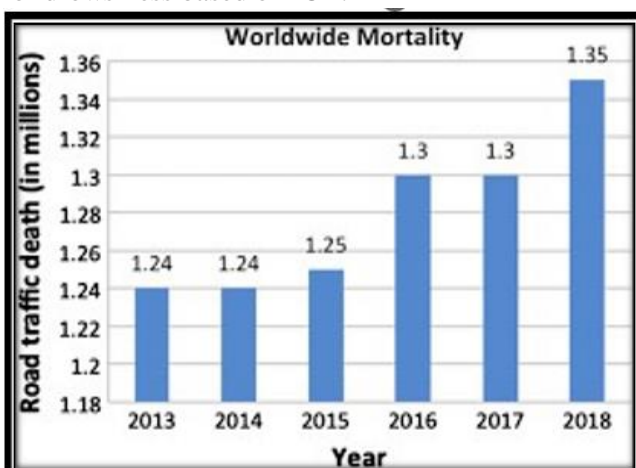
**Fig.2. Worldwide mortality rate based on driver drowsiness**

As from the above fig.2. one can observe that as yearly the drastic increment of road traffic deaths (in millions)

were caused due to the drowsiness of drivers as world-wide.

1.1.Problem Formulation

Drowsy drivers may cause nearly a third of all deadly car crashes according to federal statistics and a study at the University of Pennsylvania Health System proves the danger. According to Dr. Michael Grandner. "A lot of people don't realize that more serious crashes are caused by falling asleep at the wheel than alcohol". "Though we've all heard of drunk driving, we haven't heard much about drowsy driving, but it's a major health problem and safety problem."Dr. Grandner, a member of the Center for Sleep and Circadian Neurobiology, says a survey of more than 17,000 people showed that most people need at least seven hours of sleep each night: While distracted driving has been getting a lot of attention lately, drowsy driving remains a major risk for motor vehicle crashes.

• Two out of every five drivers (41%) admit to having fallen asleep at the wheel at some point. One in ten said they have done so in the past year according to a new AAA Foundation for Traffic Safety Study.

• One in six (16.5%) of deadly crashes, one in eight of crashes resulting in a hospitalization, and one in eight out of fourteen crashes in which a vehicle had to be towed involved a drowsy driver.

• The National Highway Safety Administration estimates that drowsy driving results in 1,550 deaths, 71,000 injuries and more than 100,000 accidents per year.

• More than half (55%) of drivers who reported falling asleep while driving in the past year said they had been driving for less than one hour before falling asleep.

• Many traffic researchers believe drowsy driving has been under-reported and underestimated.
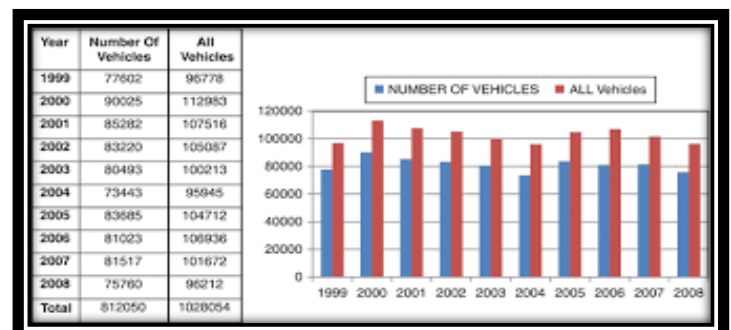
Fig.3.Number of Vehicles crashed due to drowsiness

As from the above fig.3. one can observe that the total number of vehicles are reduced from all vehicles due to drowsiness accidents as yearly.

1.2.Objective of the project

The main objective of this project is to designed and develop a device that has a capability to reduce the accidents and to overcome the problem related to drivers experiencing drowsiness. So that we design a device that keeps the driver focused on the road.
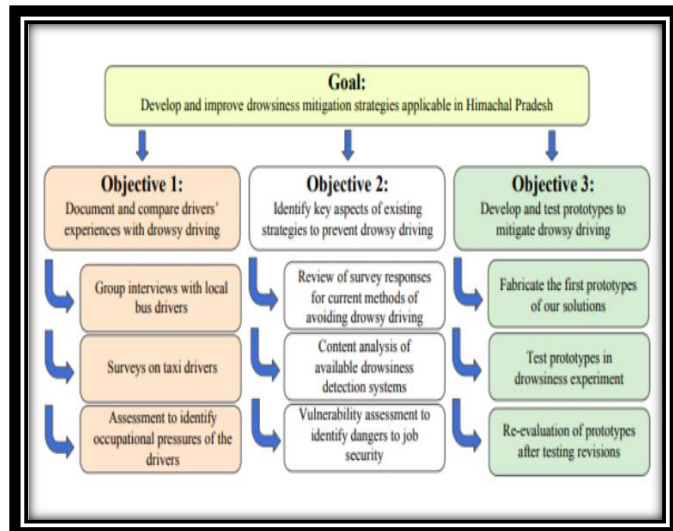

Fig.4. Objectives to Develop and improve the drowsiness mitigation strategies in Himachal Pradesh.

As from the above fig.3. We Can observe that the various types of objectives based on to prevent and mitigate the drowsy driving strategies in Himachal Pradesh.

2.METHODOLOGY

As the accidents caused by the driver drowsiness. So that to overcome from accidents we designed a device called driver drowsiness detection based on Arduino nano

2.1. Existing Methodology
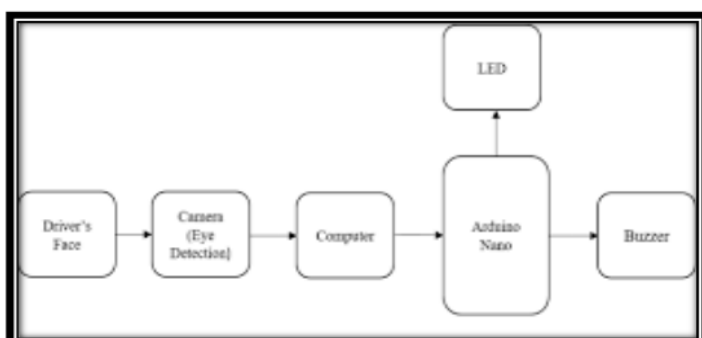
Fig.5.Block diagram of driver drowsiness detection system for Existing methodology.

As the above fig.3.explains about the process of drivers face detection to the buzzer with the help of Arduino nano. In this process the first drivers face

will be detected by the camera (EYE Detector) and it will be transfer the message to the computer or receiver and transmit to the Arduino nano their it will decode the message and makes the buzzer and LED glows.

2.2. Proposed Methodology
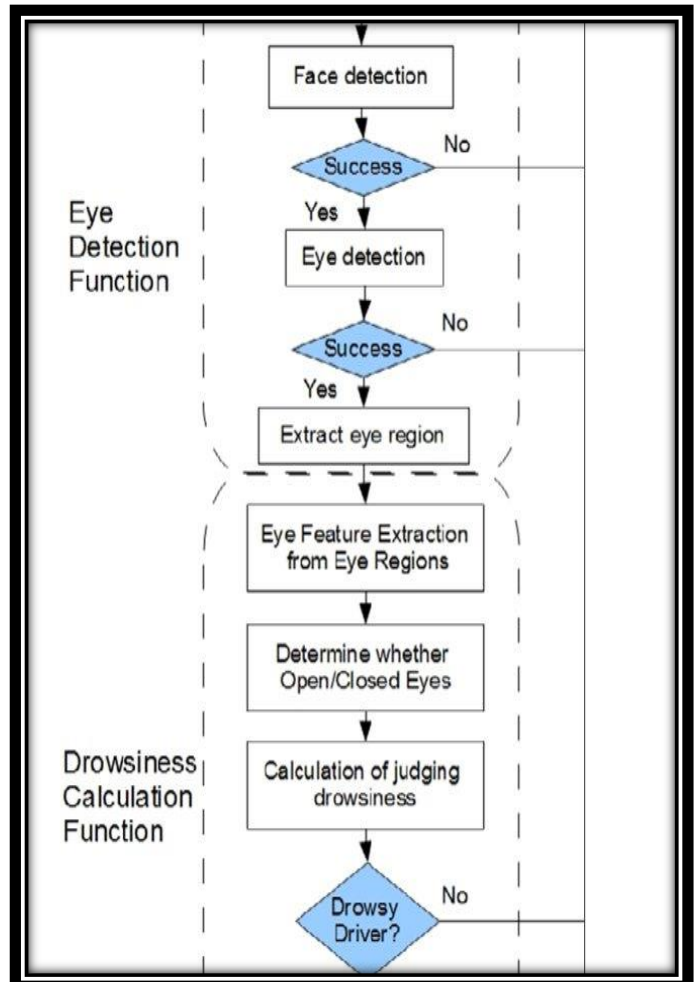
Fig.6. Algorithm for the driver drowsiness detection

As, from the above fig.4.it describes about the way of driver drowsiness detection ,in this we have two parts Eye detection function and Drowsiness Calculation function. In the Eye detection function the first face will detect if it is possible than it detects eyes if is possible than it extracts the eye region than in the Drowsiness Calculation Function after from the extract of eye region than it will determine whether the eyes are opened are closed. If the eyes are opened it will not detect the drowsiness otherwise if the eyes are closed than the eye blink sensor will detect and calculate the driver's drowsy and will send the message to the Arduino nano it will decode it according to the message transformed from the eye blink sensor and buzzer blows and automatically the driver wakes up from the drowsiness.
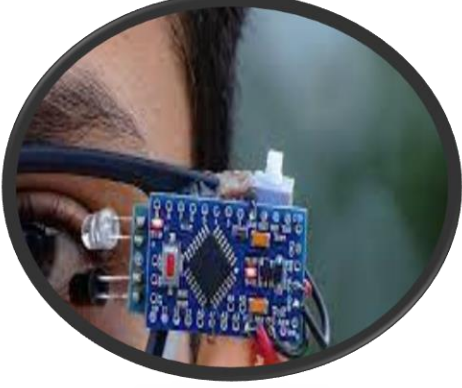
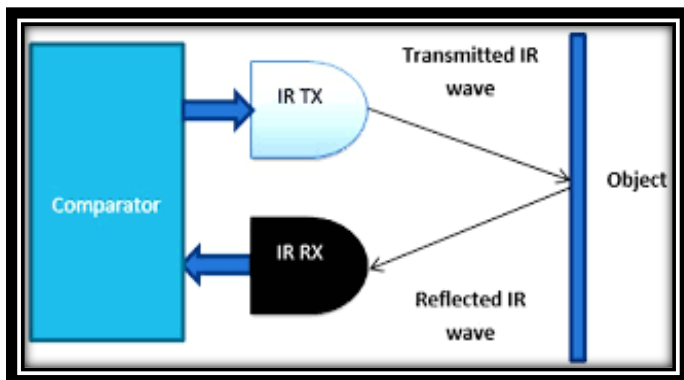**Fig.7. The out view of the eye blink sensor**

Fig.8. Schematic diagram of comparator and object for the detection of the eye.

As, from the above fig.6.it describes about the schematic diagram of comparator and object for the detection of the eye from the comparator the IR TX, it will transmitted the IR Wave to the object and again from the object it will reflected the IR Wave through IR RX to the comparator.

3.Discription of components

3.1.Arduino Nano: The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.
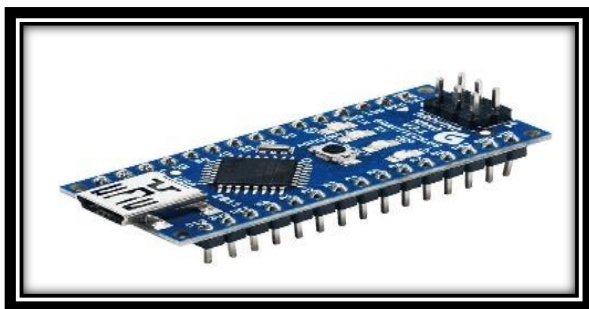

Fig.9. Arduino nano

3.2.Eye Blink Sensor:

The eye blink sensor **illuminates the eye with infrared light and monitors the changes in the reflected light**. The infrared light reflected from the eye is used to determine the results. The sensor output is active high for Eye close and can be given directly to microcontroller for interfacing application (e.g. buzzer).

Fig.10. Eye Blink Sensor

3.3.RF Transmitter:

An RF transmitter module is **a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data**. Transmitter modules are usually implemented alongside a microcontroller which will provide data to the module which can be transmitted.

The RF transmitter module uses **Amplitude Shift Keying** (ASK) and operates at 433MHz. The transmitter module takes serial data input and transmits that signal through RF. The transmitted signals are then received by the receiver module wirelessly.
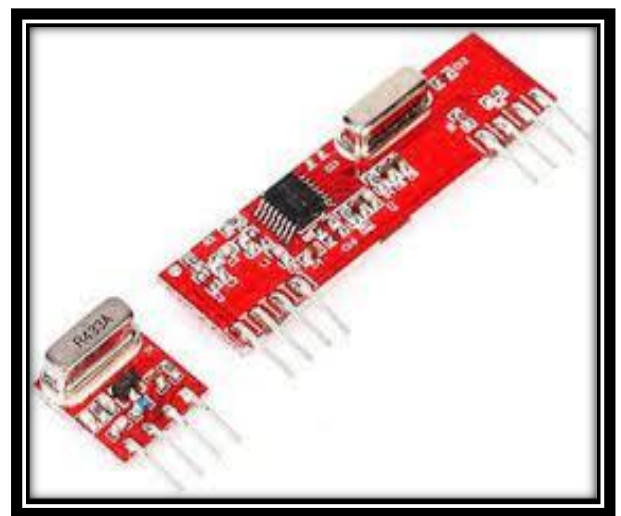

Fig.11.RF Transmitter

3.4 .RF Receiver:

An radio communications, a radio receiver, also known as a receiver, a wireless, or simply a radio, is **an electronic device that receives radio waves and converts the information carried by them to a usable form**. It is used with an antenna. The RF receiver module receives the data and sends it to the data OUTPUT pin. The output data can be decoded by the Microcontroller for further action.
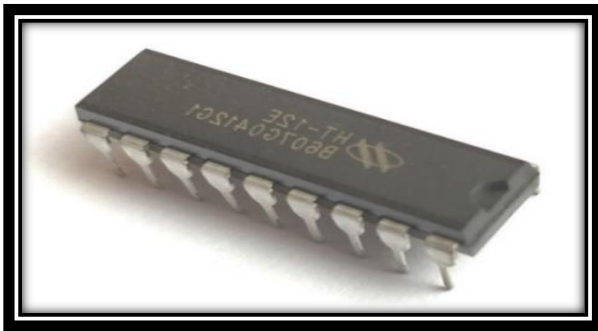

Fig.12. RF Receiver

3.5. HD12E IC:

The **IC HT12E** can be used only with its pair HT12D. These two ICs together form an **Encoder and Decoder pair**. They are 12-bit Encoders/Decoders, meaning they can transmit 12-bit a data among them. But your encoder IC should not communicate with someone else decoder IC, so an Encoder and Decoder IC pair will share a common Address which is an 8-bit data.
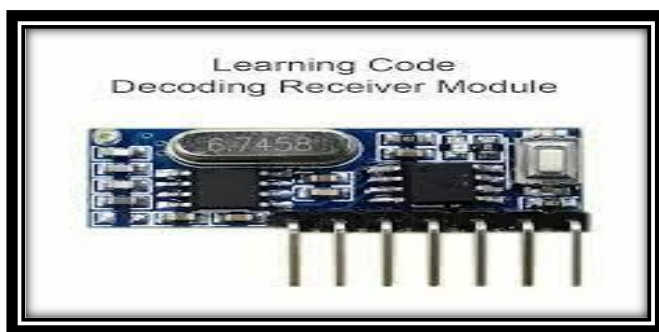

Fig.13.HD12E IC

3.6.HD12D IC:

HT12D IC is a CMOS series **12-bit RF decoder**. Mostly remote control applications have this technology. It gets to interface with the third device and helps it to decode 12-bits data. In this decoder, only 4-bits are data the remaining part is the address. The address will describe the location but 4-bits combination could make 16 types of different combinations.

Fig.14. HD12D IC

4. Programming Code for Arduino Nano for drowsiness detection

```
int flag=0;
int t1=0;
int t2=0;
void setup() {
  Serial.begin(9600);
  pinMode(2,OUTPUT);
}
int x=analogRead(A0);
  Serial.println(x);
if(x<400 && flag==0) {
    flag=1;
    t1=millis();
}
else if(x>400 && flag==1) {
    flag=0;
    t2=millis();
    Serial.println(t2-t1);
    if((t2-t1)>1000) {
        digitalWrite(2,HIGH);
        Serial.println("Alert!!!!!!!!!!!!!!!!!!");
        delay(2000);
        digitalWrite(2,LOW);
    }
    else;
  }
}
```

Fig.15. Programming Code for Arduino Nano

As the above fig.15. describes about the programming code for Arduino nano for the detection of drowsiness.

5. Conclusion and future Scope:

The driver drowsiness detection system is used to detect the drowsiness of the driver. If there is drowsiness the buzzer sounds until the eyes gets opened.The number of road accidents caused by drowsiness drivers was 1,643 in 2018.Hence in order the reduce the accidents due to drowsiness and alcohol consumption can be reduced by using the eye blink sensor and alcohol sensor respectively. Hence when they are detected the speed of the car slows down and stop which avoids the rash driving.Accidents due to driver drowsiness can be prevented using eye blink sensors. The driver is supposed to wear the eye blink sensor frame throughout the course of driving and blink has to be for a couple of seconds to detect drowsiness. The eye-blink sensor works by illuminating the eye and eyelid area with infrared light, then monitoring the changes in the reflected light using a phototransistor and differentiator circuit. The exact functionality depends greatly on the positioning and aiming of the emitter and detector with respect to the eye. The sensor is connected with Arduino nano. The values of the blink rate will be displayed in the serial monitor of the Arduino nano. This proposed system helps in finding drowsiness by using Arduino. This helps in avoiding many accidents. Further we extend this project by using webcam to detect the drowsiness of the driver.

6. References

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