IPEC Journal of Science & Technology, Vol. 02 (01), June 2023
ISSN: 2583-3286(Online)

Design & Development of Safety Belt Jazzed System

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***Abstract:* *This paper presents a face detection drowsiness system for cars that combines several features to detect and prevent drowsy* driving, drunk driving, and seatbelt non-compliance. The system uses computer vision techniques to analyse the driver's face and detect signs of drowsiness, such as drooping eyelids and head movements. In addition, the system includes an alcohol detector that measures the driver's blood alcohol concentration and alerts them if it is above the legal limit. The system also includes a seatbelt detector that detects whether the driver is wearing their seatbelt and alerts them if they are not. When the seatbelt is put on then the car ignition will be on but when the driver is not wearing the seatbelt or forget to put it on then it will automatically detect it and hence the car ignition will be turned off or it will not turn on Finally, the system uses a buzzer to alert the driver if any of these conditions are detected, prompting them to take corrective action to avoid accidents. The system has the potential to significantly reduce the incidence of accidents caused by drowsy or drunk driving and non-compliance with seatbelt laws, making driving safer for everyone on the road.**

***Keywords*— Computer Vision, Drowsiness, Drooping eyelids, Seatbelt non-compliance.**

I. INTRODUCTION

[1]With the exponential increase in the number of vehicles on the roads, the occurrence of road accidents has become a major concern. Driver fatigue, alcohol consumption, and negligence are the major contributors to such accidents. To address these issues, the development of advanced driver assistance systems that can detect the driver's behavior in real-time is a significant challenge. [2]One such safety technology is driver drowsiness detection, which can prevent accidents caused by driver fatigue. Drowsiness often leads to a lack of alertness while driving, resulting in accidents due to distractions or fatigue. The system uses an alarm to alert the driver in real-time. [1]Driver drowsiness is a significant risk in transportation systems, with accidents resulting in fatalities or serious injuries. This project aims to develop a drowsiness identification system that can accurately monitor the driver's eye state in real-time, identifying the position of the driver's eyes as open or closed. [3] This framework will help prevent accidents caused by driver fatigue and make driving safer for everyone.

II. LITERATURE SURVEY

[1] This document presents a review report on a research project in the field of computer engineering aimed at developing a system to detect driver drowsiness and prevent accidents caused by driver fatigue. The report discusses the results and solution from the limited implementation of the project's various techniques. The real-world implementation of the project provides insight into how the system works and suggests improvements that could enhance the overall utility of the system. The authors' observations are also presented to aid further optimization in the field and achieve a safer road at a better efficiency.

[2] Recent works related to driver drowsiness detection and alert system are surveyed in this paper. Machine learning techniques, such as the PERCLOS algorithm, HAAR based cascade classifier, and OpenCV, are used to predict the condition and emotions of a driver and improve road safety. Bio-indicators, driving behavior, and facial expressions are some of the parameters used to estimate a driver's condition. The paper also identifies the challenges faced by current systems and presents research opportunities to address them.

[3] Driver drowsiness is a major cause of road accidents worldwide. In this proposed paper, a smart alert system for intelligent vehicles is constructed to automatically prevent drowsy driving. A robust alert system is necessary to address the natural phenomenon of drowsiness in the human body. The proposed system analyzes video streams using the Eye Aspect Ratio (EAR) and Euclidean distance of the eye concept to detect driver fatigue. The face landmark algorithm is used to detect the eyes accurately. The IoT module issues a warning message,

Date of Submission: 5 May 2023
Date of Acceptance: 20 June 2023
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ISSN: 2583-3286(Online)

along with information about the impact of collision and location, when the driver's fatigue is detected. A voice speaking through the Raspberry Pi monitoring system alerts the driver.

[4] Road traffic accidents are a leading cause of injury and death worldwide. Driver drowsiness accounts for approximately 100,000 accidents per year in the United States alone, and the cost of traffic accidents in Europe is estimated at around 160 billion Euros. To address this issue, a novel approach to real-time drowsiness detection is proposed in this paper. The approach is based on a deep learning method that can be implemented on Android applications with high accuracy. The proposed model compresses the heavy baseline model to a lightweight one and uses facial landmark key point detection to recognize when the driver is drowsy. The model achieves an accuracy of over 80%.

FLOW CHART:

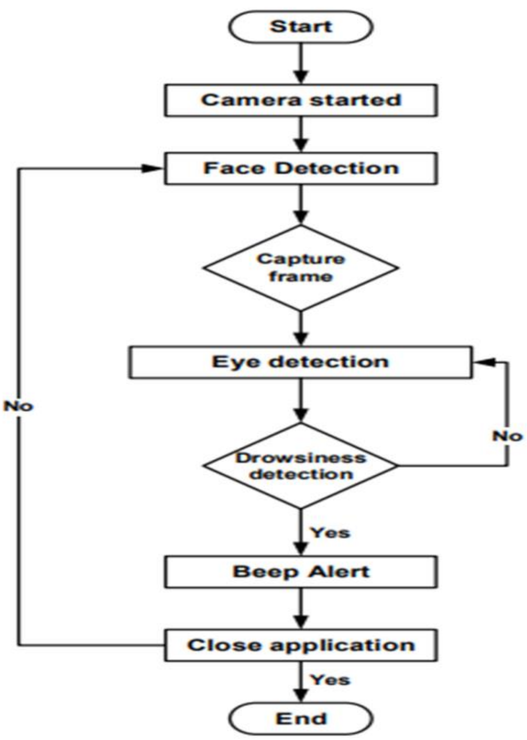

Figure 1. Flowchart

1. Once the car engine starts, the camera positioned in front of the driver's seat will begin to detect the driver's face.
2. A naming technique is utilized to identify the region of the face after eliminating the background from the image. [5] This technique connects parts in a 2-D double image, resulting in a network of the same size as the original image, which contains labels for the associated objects in the parallel picture.
3. Following the capture of the face, [6]the Eye Detection process begins, which usually employs the Eigen approach. This is a time-consuming process, and once the eye detection is completed, the output is compared to a reference or threshold value to determine the driver's condition.
4. If drowsiness is detected, [7] the system will produce a beeping sound to alert the driver, and only the driver can deactivate the alert alarm. This process will continue until the engine is turned off.
5. If drowsiness is not detected, the system will continue to detect the driver's eyes.

BLOCK DIAGRAM:

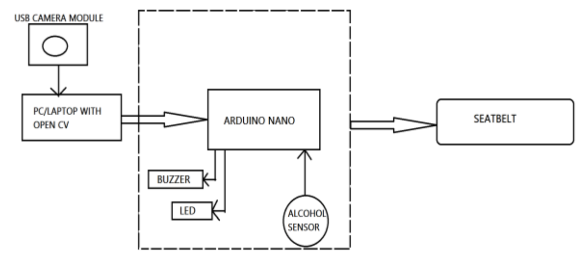

Figure 2. Block Diagram

CIRCUIT DIAGRAM:

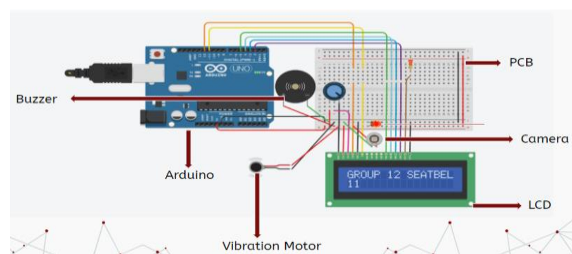

Figure 3. Circuit Diagram

LIST OF COMPONENTS:

ARDUINO NANO:

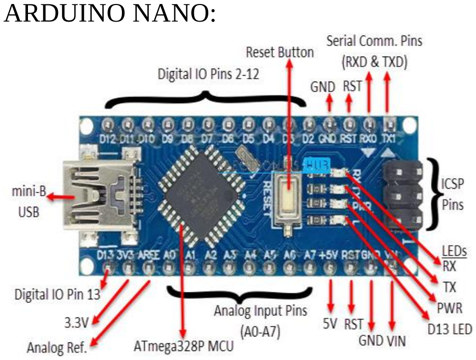

Figure 4. Arduino Nano

ISSN: 2583-3286(Online)

[8] The Arduino board features pins that can be set as either inputs or outputs, and their functioning in these modes can be explained. [9] It is worth mentioning that a large number of Arduino's analog pins can be configured and utilized in the same way as digital pins.

ARDUINO COMPATIBLE LCD:

Figure 5. LCD

[10] A character LCD display is a distinct type of display that has the capability to produce only individual ASCII characters with a fixed size.

SOLDERABLE BREADBOARD:

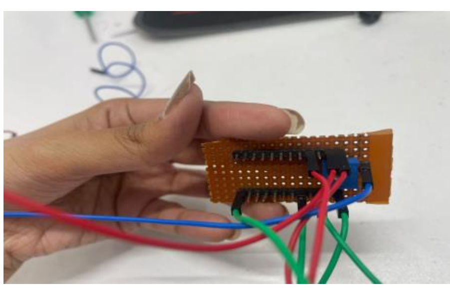

Figure 6. Breadboard

Power supply circuits serve as the primary source of power or battery for all electronic devices and circuit boards. [11] These circuits typically contain the power that is supplied to sub-circuits within an electronic system.

BUZZER:

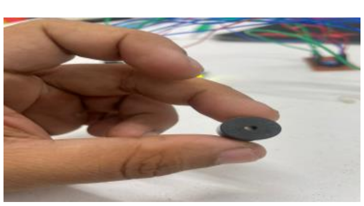

Figure 7. Buzzer

[12] The buzzer is a sounding device that converts audio signals into sound signals. It is usually powered by DC voltage.

ALCOHOL DETECTOR:

[13] The MQ3 sensor is a popular type of gas sensor from the MQ sensor series. This sensor uses MOS (Metal Oxide Semiconductor) technology for detection. [14] The sensing material in metal oxide sensors is sensitive to changes in resistance when exposed to certain gases, which is why they are also referred to as Chemiresistors. In particular, [15] the MQ3 sensor is commonly used for detecting alcohol vapors.

Figure 8. Alcohol Sensor

III. RESULTS & DISCUSSION

CASE A: No Drowsiness

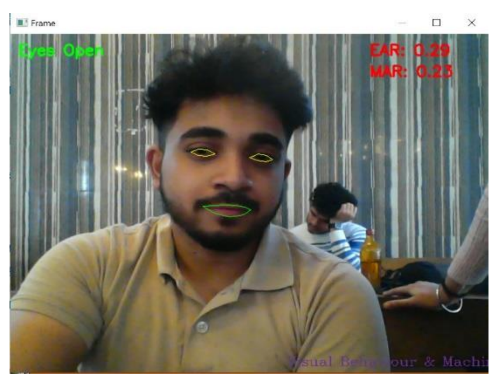

Figure 9. Eyes Open

This picture depicts that there is no drowsiness detected and typically features open and alert eyes. This visual cue can be indicative of someone who is awake, attentive, and engaged in their surroundings. It also shows the EAR AND MAR ratios[16] that is helpful for detecting drowsiness.

ISSN: 2583-3286(Online)

Figure 10. No Drowsiness

This is the display screen which further shows "D: N" that means no drowsiness also we can see "B: N" that means person is not wearing seatbelt.

CASE B: Drowsiness Detected

Figure 11. Eyes Closed

This picture shows that driver's eyes are closed that is the clear indication of drowsiness or sleepiness. It also shows the EAR (eye aspect ratio) and MAR(mouth aspect ratio) ratios. The below image is the display screen which further shows "D: Y" that means drowsiness detected also we can see "B: Y" that means person is wearing seatbelt.

Figure 12. Drowsiness Detected

CASE C: Yawning, Drowsiness Alert!

This picture shows the yawning condition of the person which

is a strong indicator of fatigue or sleepiness. [17] By counting the number of times the person in the picture yawns, it may be possible to develop a quantitative measure of drowsiness that can be used to trigger an alert or other intervention.

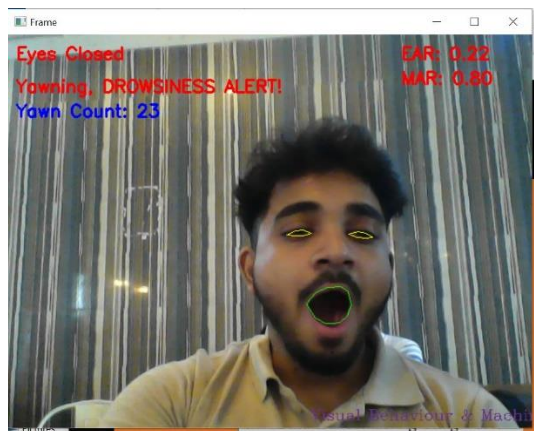

Figure 13. Yawning

CASE D: Alcohol Sensor Value

The is showing [18] an alcohol value below 700 ppm (threshold value set by us) in an alcohol sensor can indicate that the individual being tested has a low level of alcohol in their system.

ISSN: 2583-3286(Online)

Figure 14. Alcohol Value

IV. CONCLUSION

[19] In the future, researchers may explore the use of external factors such as vehicle conditions, sleeping patterns, weather, and mechanical data to measure fatigue. [20] Driver drowsiness is a significant threat to road safety, especially for commercial vehicle operators. Factors such as 24-hour operations, high

mileage, challenging environments, and demanding work schedules contribute to this safety issue. [21]To address this problem, it is crucial to monitor the driver's level of drowsiness and provide feedback so that appropriate action can be taken. [22]However, the current system does not allow for adjustments in the camera's zoom or direction during operation. Future work may focus on automatically zooming in on the eyes once they are detected.

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