Driver Drowsiness Detection and Control System using Embedded System

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ABSTRACT-Drivers who are drowsy or sleepy run the risk of serious collisions. Tiredness, drowsiness, and a lack of awareness are all significant contributors to road accidents in India. Lane changes, posture/movement analysis, blink frequency detection, and other methods for monitoring driver fatigue and sleepiness are currently being considered. Due to varying lighting conditions and inherent individual variation, these methods are not particularly reliable.Drivers who are drowsy or sleepy run the risk of serious collisions. The ESP32 controller receives continuously the live images captured by the webcam. The cam32 module uses the length of the iris as a parameter to analyze the blink rate, the collection of behavioral and physiological parameters. Personal AI interfaces for real-time monitoring and detection of driver fatigue and drowsiness will be developed using the systems' data.

Keywords: ESP32, cam32, AI interfaces

I. INTRODUCTION

Drowsy people have a strong desire to sleep and are close to falling asleep. It can mean both the routine state before going to sleep and the chronic condition in which you stay in that state without paying attention to a set rhythm. Sleepiness can be harmful when performing tasks that require constant attention, like driving a vehicle. If a person is sufficiently exhausted, they will experience drowsiness while driving, which raises the likelihood of a collision with another vehicle. This project's objective is to create a simulation of a sleepiness detection system. The development of a system that can precisely determine whether the driver's eyes and mouth are open or closed will be the primary focus. It is thought that a driver's sleepiness can be detected early enough to prevent an accident by keeping an eye on them. Yawning detection is one method for determining how tired a driver is. To ensure that their brains receive sufficient oxygen before falling asleep, tired people frequently yawn. To detect tiredness and drowsiness, a series of facial photographs and an observation of how long the eyes and mouth are open or closed are used. was released is yet another method for determining when the eyes have closed. The percentage of time spent with the eyelids closed serves as the foundation for this method of detection. Drowsiness and exhaustion account for the majority of traffic accidents in Malaysia. As a result, Python-based Driver Drowsiness Detection is being developed to reduce the number of car, truck, and lorry accidents. When the device detects the buzzer of fatigue, drivers are notified when they are tired.

II LITERATURE REVIEW

[1] AldilaRiztiane et al (2017):

Every year, more people lose their lives in traffic accidents. Road accidents can have a variety of reasons, but surprisingly, human mistake, such being sleepy, is the main one. The notion for a software that can monitor a driver's eye movement while they are driving is thus inspired by this problem. The "Driver Drowsiness Detection" application runs on Android-powered mobile devices and wearables. The app's function is to notify users so that they can be warned not to drive when fatigued and advised to pull over. The "Driver Drowsiness Detection" software uses the front camera of an Android handset to identify and track the eyes using Haar-cascade Detection and template matching in OpenCV. Testing has been done to make sure the usability, conduct, effectiveness, and user pleasure are as anticipated. Despite this, the information the application still has a number of limitations, particularly in link between adequate illumination, facial concealment, and the software has correctly spotted the eye in the eyes area. blinks at a distance of 20 to 50 cm and an angle of 30 to 60 degrees in addition to the heart rate.

[2] Dr.S. Priyadarshini et al (2019):

This technology is intended to improve driver and road safety. A colour video taken inside a car is used to find the driver's face using computer vision algorithms. The driver's eyes are then located using face detection, and those locations serve as templates for eye tracking in following frames. Images from the tracked eye are utilized to identify tiredness and produce alert warnings. The suggested method consists of three phases: Face, Eye, and Drowsiness detection. The function of image processing is to identify the driver's face before extracting the picture of the 5 driver's eyes for sleepiness detection. The Fourier face identification method uses recorded picture frames as its input and outputs the faces it has identified. It may be said that this strategy is a low-cost and efficient way to promote transportation safety by reducing the number of incidents brought on by drowsy driving.

[3] R.Rajasekhar Reddy et al (2019):

In recent years, driver weariness has risen to the top of the list of factors contributing to vehicle collisions worldwide. Drowsiness in the driver is a certain indicator of driving weariness. Therefore, it is crucial to spot the driver's tiredness in order to help them get to their destination safely and without incident. The major goal of this research is to develop a solid framework that works with the application for tiredness detection. The main goal of the work is to continually record photos from the driver and collect ocular information in line with the given algorithm. In this system, a camera records the footage, and each frame uses image processing to identify the driver. The recognized face has pointed facial traits. Drowsiness is identified in accordance with the estimated values of the aspect ratio, mouth opening ratio, and nose length relationship.

[*4] MUNDURU SYAMALAKUMARI et al (2020):*

Today, more and more jobs need long-term dedication. Drivers must pay strict attention to their lane in order to react swiftly to unforeseen circumstances. Additionally, driver fatigue is the main factor in many traffic accidents. Additionally, devices that can detect and alert a driver to their poor psychophysical condition are required in order to significantly lower the incidence of accidents involving exhaustion. However, there are a number of challenges in developing these systems that pertain to the quick and accurate assessment of a driver's tiredness symptoms. One of the technology options for incorporating driver sleepiness monitoring systems is the use of the vision-based technique. The article discusses the existing sleepiness detection tools for drivers. Here, we estimate the driver's 6 visual system to determine whether or not he is sleepy. Additionally, if the driver is sleep deprived, a warning message will be sent to registered users, and the police central controller will get a latitude and longitude position to help locate the driver and prevent a problem.

[5] Anandu Santhosh et al (2020):

The number of traffic accidents happening in the globe today is rising quite quickly. Road accidents can cause minor injuries in some cases, catastrophic injuries in others, or even fatalities in rare cases. The automobiles involved in these traffic incidents may collide with one another or smash into buildings or other objects. Even deaths from traffic accidents are possible. Around 1,50,000 people are thought to perish in road accidents in India each year, which equates to about 400 incidents each day. Today, there are an increasing number of road accidents worldwide. Depending on the circumstances, traffic accidents may result in minor wounds, severe wounds, or even fatalities. These traffic accidents might result in vehicle collisions or vehicle collisions with buildings or other objects. Accident-related deaths are even probable. In India, it is estimated that road accidents claim the lives of over 1,50,000 people annually, or 400 incidences every day. Using OpenCV, dlib, and Python, driver drowsiness detection primarily employs the idea of a mathematical value called Eye Aspect Ratio (EAR), which is a straightforward and efficient method. The suggested method has a number of benefits over the conventional MATLAB-based face detection methods, including: A) Speed: Java, which was created from C, was used to create MATLAB. Consequently, the computer starts up by When a code is scripted and executed on, the computer interprets the code, converts it to Java, and then eventually executes the script MATLAB. However, OpenCV uses C/C++ library functions, which connect the computer directly to the machine. language code, which facilitates quicker execution. With OpenCV, time and resources are used more efficiently in processing images rather than comprehending them. 7

[6] Aman Dohar et al (2020):

According to various investigations and reports, weakness and fatigue are some of the leading causes of serious traffic accidents. Many drivers operate their cars, trucks, moving vans, and other vehicles during the day and into the evening. Occasionally, they experience the negative effects of lack of sleep. The framework's primary goal is to recognize the driver's facial expression. If the framework notices that the driver is showing signs of fatigue, it will send out an alert to warn other drivers or inform the passengers. This calculating camera continuously captures the most significant development in the eyes, lips, and facial movement. Because of this, the conclusion time for drowsy drivers is longer than usual eye flickering. It is possible to gain a foothold for image preparation with that live video spillage. Typically, pictures are taken at a fixed frame rate of 20 fps. By measuring the orientations of the right and left eye, nose, mouth, left and right ear temple, and comment informational collection, the definition highlights the position where the most thrust is feeling lazy. The human visual environment talks in some way to the scene element that contains two or three important pieces of information. The assessment selects unmistakably, sensing bits of info with reference to a person's face and concentrates those major factors structure the images using Python and two or three OpenCV libraries. For the most part, it requires the article's images to be reduced in size as data before detecting the driver's condition as being caught in an ebb and flow state for slowness utilizing the consideration edge extent. When the structure detects any sporadic increase in the most thrust, it will inform the most thrust, explorer, or naval force controller, warning them to proceed with care and noting pop-ups and vibrations.

[7] Pratik Avasare et al (2021):

A computer’s vision-based thoughts concept has been used for creating this Drowsy Driver Detection System. The camera being the initial point of the system by providing the live feed of the 8 driver to the framework that concentrates it straight towards the face of driver and checks the driver's eyes with a particular

objective to catch drowsiness of the driver. On analysing the live video an alert is issued to the driver in circumstances where drowsiness is outcome of the analysis. The framework moves the control of the program forward using information picked up from the picture to find the facial tourist spots, which helps the system to identify where the eye's location of an individual exist. If the eyes of driver are closed for a specific amount of time, the proposed framework draws a conclusion that the driver is feeling drowsy and an alarm for safety is sound. The system works after initially face is recognized and eyes are spotted, it also works well in dim lighting conditions too.

[8] Sanjay S et al (2021):

One of the main factors in traffic accidents is drowsy driving. Although it can't be entirely avoided, this model can help prevent it. The usage of drowsiness monitoring equipment helps motorcyclists avoid nodding off while operating a vehicle. Using this technology, passengers and traveling companions are protected. The algorithm can watch the space between the driver's eyes by placing an IR camera in front of the driver. The technology sounds an alarm to alert the driver to take control of the vehicle when the region is under curtain measurement for multiple consecutive frames. When the driver closes their eyes again and the area rises over the safe area, the alert stops. By doing this, the motorist may be prevented from falling asleep at the wheel and save lives. The accuracy of the algorithm is 96%.

[9] R.Vishnu et al (2021):

The world's leading contributor to injuries is drowsy driving. Sleep deprivation and fatigue can produce sleepiness, which can happen even when cycling. The best strategy to prevent accidents caused by sleepy drivers is to identify their tiredness and alert them before they fall asleep. Many methods, including ocular retina detection and facial function recognition, have been employed to detect tiredness. In this study, we propose 9 a technique for detecting driver sleepiness that makes use of ocular retina detection and pulse charge detection. On this record, we support a hybrid approach to eye retina identification and pulse sample detection that is more accurate in detecting tiredness. Exclusive strategies for drowsiness identity can be partitioned into standard classifications. The techniques inside the first collecting apprehend the extent of the tiredness focused across the physiological modifications in the body. Eye repute, speech houses, time interval between two yawning, head function, sitting carriage, coronary heart price, and mind alerts are absolutely a couple of illustrations of the techniques inside the first classification. Drowsiness moreover brings about a few changes within the driving style. Techniques within the second category estimate the motive force. Drowsiness level by following these progressions. storage attitude, distance from the subsequent car, lateral role of the car, longitudinal pace, longitudinal speeding up, and lane departure are applied as a part of the method of the second one class.

[10] Elena Magán et al (2022):

In order to prevent traffic accidents, this paper describes the construction of an ADAS (advanced driving assistance system) that is specifically focused on driver sleepiness detection. It is essential that fatigue detection in a driving environment be performed in a non-intrusive manner and that the driver not be troubled by alarms when they are not drowsy. Our method for solving this open challenge makes use of image sequences that last 60 s and are captured in a way that makes it possible to see the subject's face. To detect whether the driver shows symptoms of drowsiness or not, two alternative solutions are developed, focusing on the minimization of false positives. The first alternative uses a recurrent and convolutional neural network, while the second one uses deep learning techniques to extract numeric features from images, which are introduced into a fuzzy logic-based system afterwards. The accuracy obtained by both systems is similar: around 65% 10 accuracy over training data, and 60% accuracy on test data. However, the fuzzy logic-based system stands out because it avoids raising false alarms and reaches a specificity (proportion of videos in which the driver is not drowsy that are correctly classified) of 93%. Although the obtained results do not achieve very satisfactory rates, the proposals presented in this work are promising and can be considered a solid baseline for future works.

III. EXISTING SYSTEM

When the eyes of Auto driver are identified, the tiredness location capability distinguishes regardless of whether the driver is sleepy, by thinking about whether the eyes are open or shut that is the condition of the eyes. In realtime drowsiness detection, it is necessary to slow down or slow down the speed of the vehicle. The detection of threshold drowsiness ought to be put on hold in order to establish continuous monitoring. A signal that directs the vehicle's braking is generated when the level of drowsiness is continuously monitored and reaches a certain value.

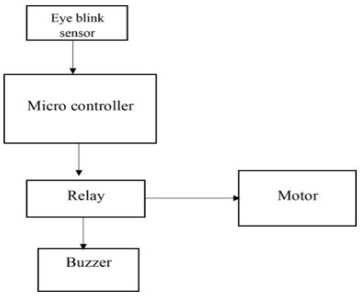

Fig1.Existing System Block Diagram

IV. PROPOSED SYSTEM

We have proposed the idea for using the IMAGE processing algorithm to detect driver drowsiness in this proposed work by utilizing embedded "C" techniques. The methods of human skin mapping, face part extraction, and classification have been used to achieve the work's goal. The ESP camera is used to measure a person's health by sensing things like yawning, distraction, head movements, and eye lid closure. The body's distance from a reference location is frequently calculated using these sensors. The device uses the relay module to notify the circuit breaker to disconnect the troubled area. in this way, prevents harm to the system. The buzzer will also be used to convert the signal from the automatic break application, and the data from the systems will be used to create personalized AI interfaces for monitoring and detecting driver weariness and sleepiness in real time.

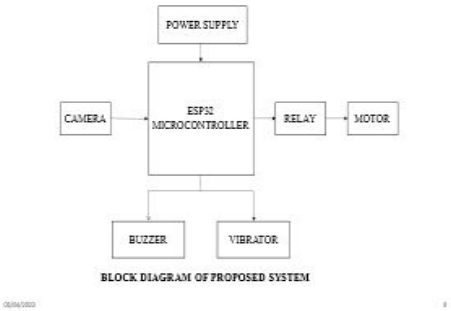

Fig2.Proposed System Block Diagram

***A**. POWER ADAPTER*

The majority of AC/DC adapters started out as linear power supplies that included a transformer to lower the voltage of the mains energy, a rectifier to produce pulsating DC, and a filter to smooth the pulsating waveform into DC with no ripple fluctuations that could harm the powered device. The device's size and weight were largely due to the transformer, which was influenced by the power output and mains frequency. Gadgets with evaluations more noteworthy than a couple of watts were too huge and weighty to be truly upheld by a wall power source. The load changed the voltage that these adapters output; As a result, equipment that required a voltage that remained constant received circuitry for linear voltage regulators. As a result of losses in the linear regulator and transformer, an excessive amount of power was lost as heat even when there was no load being driven.

***B.** POWER SUPPLY*

An apparatus that converts one voltage into another, more useful voltage while transmitting power is known as a power supply. The input and output are considered when designing power supplies. Because they are produced after the amplification phases, it is tempting to consider them as an afterthought; in point of fact, a number of products sold in stores reflect this mindset. The fact that an amplifier is essentially a modulator that regulates the flow of energy from the power supply to the load is the most important concept to comprehend. If the power supply is inadequate and lacks the energy to meet the amplifier's peak demands, even the most exquisitely designed amplifier will be useless.

C.CAM32

Fig3.CAM32

The ESP32-CAM board's quick start guide can be found in this article. We'll show you how to set up an ESP32 camera module and a video streaming web server with face recognition and detection in less than five minutes using the Arduino IDE. On ROBU, you can get this module at a very low price. It comes with an OV2640 camera and a number of GPIO pins for connecting peripherals. The fact that this module comes with an SD card adapter makes it convenient to stream images taken by the camera module and save data on the card. The ESP32 camera's key features will be shown to us.

D.BUZZER

Fig4. Buzzer

A buzzer or beeper is an audio signaling device which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as mouse click or keystroke.

E. VIBRATOR

Fig5.Vibrator

Vibrator is an electromechanical device that takes a DC electrical supply and converts it into pulses that can be fed into a transformer. It is similar in purpose (although greatly different in operation) to the solid-state power inverter.

F. LCD Display

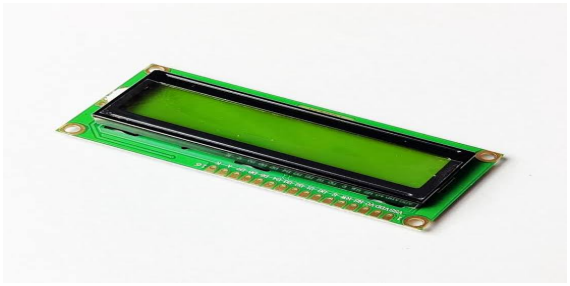

Fig6.LCD Display

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly but instead use a backlight or reflector to produce images in color or monochrome.

V. WORKING

The image of the driver is captured with the help of camera. Then the image is processed and the detection takes place. The eyes of the image is cropped and the eye detection will be done. If the eyes are detected as drowsy then the buzzer will start beep and the vibrator in the steering starts vibrating. If there is no change in the face of the driver then the brake will be applied through motor. When there is no drowsiness in the eye detection, then itwill continue the detection.

VI. RESULT

Here is the output in the LED Display of the drowsiness detection system.

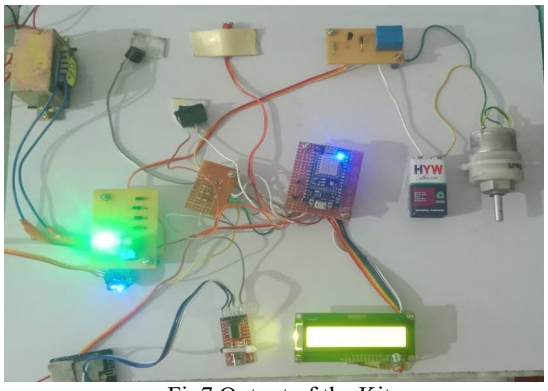

Fig7.Output of the Kit

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VII. CONCLUSION

The approach of the system is to detect the sleoiness and alerting the driver. The system enables the early detection of drowsiness of the driver and the activation of the alarm in the event of an accident. To prevent any type of accidents, the driver must be attentive. Drunk drivers can make serious risk to both their own and other's safety. Designing a system which will be used to identify sleepiness has a lot of potential and it will ensure the safety.

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