International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 06 | June - 2022 Impact Factor: 7.185 ISSN: 2582-3930

Driver Drowsiness Detection System Using Machine Learning Techniques

Dr.Bindiya.M.K [1], Lavanya S [2] , Mandhara R [3] , Poojitha Anand [4] , Ramya R [5]

[1]Associate Professor ,Department of Computer Science and Engineering& SJBIT, Bengaluru, 560060

[2,3,4,5]Student, Department of Computer Science and Engineering& SJBIT, Bengaluru, 560060

Abstract - Driver's drowsiness discovery is a safe driving technology that greatly helps to avoid accidents that are directed at the driver to fall asleep. Drinking alcohol and loose belts are also some of the major causes of road accidents. In this paper, a system has been introduced that can alert motorists and prevent them from driving while they are drowsy to reduce road accidents. The program also prioritizes issues such as wearing a seat belt, preventing unauthorized access, and driving under the influence of alcohol, among others. The existing system detects the driver's expressions and may calculate the level of sleep using advanced algorithms based on Artificial Intelligence. The system detects drowsiness using the 'Eye Aspect Ratio' (EAR) facial mark calculation to determine drowsiness, and verification is confirmed using face recognition technology. The result of this paper can be clarified that the system ensures the safety and security of the driver and vehicle by preventing the driver from falling asleep while driving.

Key Words: Drowsiness Detection, Digital image processing, Computer Vision, Road Accidents.

1.INTRODUCTION *(Size 11, Times New roman)*

The majority of car accidents are caused by drowsy or drunk driving, as well as working settings, lack of sleep, and time constraints. Drunk driving affects the from tiredness and driving while inebriated The first element in our project is drowsiness detection, where we are utilizing a camera to detect an image or a face. The most significant component of this project is eye detection, which have been carried out using OpenCV. The camera's input is 8 megapixel that can capture real-time photos and video. PC With Camera will be used to process the obtained frame. Python is used to implement the algorithm. Eye near detection uses the Haar cascade algorithm and the canny edge detection algorithm, it compares photos of both true and false values, returning a border which in red colour shaped by rectangle over the detected area when they match. After every ten seconds, the rate of eye closure is calculated. PC sends a connection to its Arduino Uno, if it reaches a predetermined threshold value. When the arduino receives a strong pulse signal, it conducts a series of actions, such as sounding an alarm or sending a message to the car's owner. The alcohol sensor (MQ-3), on the other hand, functions as a breath-analyzer, calculating alcohol content in the blood. The MQ-3, Bluetooth, buzzer, and relay are all connected to the Arduino. Arduino constantly monitors the amount of alcohol in the air and it also calculates the percentage of blood alcohol content. If the calculated percent BAC exceeds the threshold, the buzzer will sound an alarm, and the relay will be turned off. If you are over the limit, send a text message to the automobile owner via GSM

2. LITERATURE SURVEY

This study focuses on detecting fatigue and alcoholism in motorists in real time. This program detects most of the road accidents caused by fatigue or drunken driving. To achieve this goal, an embedded gas sensor system and computer vision are used. In this system we use Sleep Discovery, Alcohol, Raspberry Pi, Arduino UNO, Open CV, and Embedded system. ARM Awareness system uses an open CV library. " This is connected to a USB camera for taking continuous photos, which are then processed using OpenCV and compared to an existing website. If existing images are not enough, if any existing images are matched, the system sends a command to the output unit to perform GPS location identification and send the appropriate information about the person found to the relevant authority via GSM / GPRS. This program can fully monitor the driver's monitoring of the "Computer Vision System for Driver Fatigue." level and warn the driver if he is in an unsafe driving condition. The viola jones algorithm for facial and eye detection is used to identify driver fatigue.

The program is built with the help of a video camera, Raspberry Pi hardware, OpenCV open computer library, and Microsoft Visual Studio. The author of "Tracking Eye State for Fatigue Detection" focuses on tracking eye condition. Photos are taken with the camera and used as an input for the suggested tracking method. In the first stage, we use a colored space to find the drivers' faces and remove them from the back. The next step is to calculate the eye size and crop the image in this area. The upper and lower eyebrows are then determined by breaking the pixels of the face and the acquisition of the edge in the area with the smart user In the final section, we calculate the number of white and black pixels and then analyze the distance between them to determine whether or not. the driver is tired.

The design is based on computer vision and embedded app ideas for "Advanced Vehicle Control and Safety System Using Face Detection." In real-time setting, the system includes face detection, eye region detection, and eye level detection. The proposed system is made possible with a digital camera and a Raspberry Pi embedded system board using Raspian-OS and Python-IDLE installed in OpenCV. Various car control functions, such as locking and unlocking the center, opening and closing windows, bonnets, etc., can be controlled with an Android phone..

The created system uses the ARM7 controller (LPC2129) as the main control unit and the CAN bus inside the vehicle "Driver Behavioral Analysis Using Non-Attacking Sensors." To achieve optimal performance, ARM7 is used. The use of CAN allows for faster communication over control networks, as well as data sharing across nodes, leading to improved collaboration performance. We can get ECG, blinking eyes, and alcohol intake with the help of this technology. If a person wishes to drive, simply put their finger on the biometric system, according to "Driver Recognition Based Recognition and Alertness System Using GSM." This will be the key to the lock when the finger veins are lit like a matchstick. If the match fails, the GSM is activated and a warming message is sent. The same vehicle has the ability to detect fatigue and alcohol consumption by the diver. Raspberry Pi is connected to GSM, camera, and buzzers. The Raspbian app is pre-installed with Python and OpenCV.Alcohol gas sensor connected to Arduino.

3.PROPOSED SYSTEM

Results are available in this section. Getting rid of fatigue and getting drunk using software and hardware forums is a goal. In addition to eye and head movements, an additional visual indicator that may determine a person's level of fatigue is an eye-to-eye analysis. Creating real-time computer vision software is a complex and time-consuming process that requires a reliable processing process. OpenCV is a piece of open source software Developing a computer vision is a piece of open source software OpenCV. OpenCV is a computer language extension for C, C ++, Python, and Java. If the driver is asleep or tired, a message will be sent via Twilio, and the sound will be activated until the car owner responds with a good Twilio message.

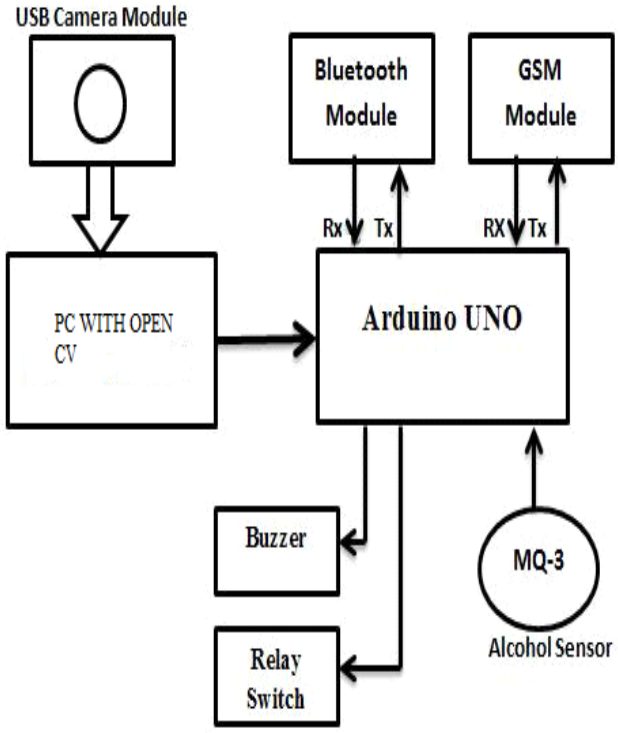

Fig -1: Block Diagram of Drowsiness Detection System

A basic blockchain diagram of the system is shown in Figure 1. The Haar Feature-based Cascade Classifier is a machine-based strategy where the cascade function is read to a large number of positive and negative images, and this fine image is used to find face and eye regions, as well as ROI updates. An open CV covers both the trainer and the detector. An open CV is used to create object dividers defined by the user. The built-in object separator is stored in the xxl file extension separator and can be used in the latest editing stages.

We also used the canny driver's edge detection in this paper to see the correct links to the eye region. On the other hand, the arduino system is used to detect human alcohol use, and the alcohol gas sensor or breathalyser MQ-3 is connected. Arduino will indicate if a person is driving under the influence. The alarm will work based on Arduino output, and the car's ignition source can be disconnected from the relay to stop the car or prevent the driver from launching it. If the driver exceeds the legal limit, the message will be sent by GSM, and the buzzer will work until the car owner responds with a good GSM message.

POSSIBLE OUTCOMES

- FACE DETECTION
- EYE DETECTION
- EYE COUNT DETECTION

- ALCOHOL DETECTION
- MOBILE DETECTION
- SEAT BELT DETECTION

4.IMPLEMENTATION

Using a computer program, which makes technical or technological information available such as programs, software components, or other computer programs. There may be more use of a specific specification or standard. For example, a web browser contains the use of specifications recommended by the World Wide Web Consortium, while the software development tool contains the use of programming language. In an object-oriented system, special situations occur when a concrete class uses a visible connector. In this case, the concrete phase is the implementation of the visual connector and has the means of implementing the interface methods. Initiation is a term used in the information technology industry to describe the process of moving a customer from the point of purchase to a software or hardware depot. This includes details. User policies, user training, and usage are all part of the analysis, domain analysis, changes, system integration, and user policies. When using a project management method, these stages are usually overseen by the project manager. Business analysts, technology analysts, solution designers, and project managers are software experts who know little about the knowledge economy.

In order to use the system effectively, a large number of connected tasks must be completed correctly. Using a well-proven approach and seeking professional guidance can help, but problems with project implementation are often caused by a large number of tasks, poor planning, and inadequate resources, rather than any tasks being particularly challenging. when it comes to cultural issues, there is often a lack of adequate consultation and two communication that prevent the desired results from being achieved. Improving safety measures to prevent drunkenness and drowsiness is a major challenge in the automotive industry. Here are some ideas on how to avoid drowsiness and driving while driving. When the driver gets into the car, starts to burn it, he will be told to give a breath sample, through an alcohol sensor, it will be determined whether the driver is drunk or not. If so, the ignition will be off. If the driver is not intoxicated, the next step will be to photograph the face. Face capture will be done with a webcam that will be placed in front of the driver near the dashboard. The camera will capture the driver's face and track the eyes and mouth. Eye tracking is done to determine if the driver's eyes are open or closed to measure sleep apnea and mouth pressure to check if he is yawning while driving. After detection and tracking of the face, eyes and mouth while driving, the system continues to detect any differences in the above parameters. Using Visual Studio 2013 and OpenCV with Emgu tracking and facial features detection is done. OpenCV uses the Emgu library containing all XML file detection and yawn detection files will be created to match the template where the already saved image will be compared to determine if the driver is in a drowsy state or not. If any parameter is checked which means if the driver is found drunk while driving or drowsy then the alarm will sound and the seats will vibrate, making the driver more alert. If the alarm sounds repeatedly over a period of time, the system will turn off the igniter and turn on the indicator lights to warn oncoming traffic to avoid a car crash.

i. Software Implementation

Python*:* Python is a beautiful and friendly language that you can use and learn. It's fun, and it can be changed in both small ones and major projects. Python will reduce your development time significantly and overall, typing Python faster than other languages. This tutorial will be a quick way to understand all the great concepts of the Python program. Python is a high-tech, high-definition programming language that emphasizes readability. Compared to Java or C ++, Python syntax allows programmers to write in small steps.

The language, developed in 1991 by engineer Guido Van Rossum, makes the process simple and enjoyable. Because of its many paradigms, Python is often hired by large businesses. In most cases, compulsory and object-oriented applications are used.

OpenCV: OpenCV (Open Source Computer Vision) is an editing library designed specifically for real-time computer vision. Created by Intel and sponsored by Willow Garage and Itseez (later acquired by Intel). Under the BSD open source license, the library has a forum and can be used free of charge. TensorFlow, Torch / PyTorch, and Caffe are among the deep learning frameworks supported by OpenCV.

Qt editor: Qt Creator is an integrated development site for C ++, JavaScript, and QML that is part of the SDK framework for Qt GUI application development framework. Comes with a visual debugger and a built-in GUI architecture and form designer. Syntax highlighting and auto-completion are among the features of the editor. For Linux and FreeBSD, Qt Creator uses GNU Compiler Collection's C ++ compiler. When compiling source code on Windows, it can use MinGW or MSVC automatically, and can use Microsoft Console Debugger. It is also possible to use Clang.

Xming with Putty: On Microsoft Windows systems, Xming is an open source XWindows terminal emulator (X Server). Xming allows Windows computers to display a graphical Linux software that is hosted on a remote Linux server. This tutorial goes beyond the basics of installation to show how to secure an X-Window session with Xming and the PuTTY SSH Client.

Embedded C: The C Standards Committee created Embedded C as a set of C language programming language extensions to deal with similar problems arising between C extensions for different embedded machines. In order to manage unusual features such as fixed-point arithmetic, multiple different memory banks, and important I / O functions, embedded C programming often required unusual changes in the C language.

Twilio: Twilio was started in 2007 by Jeff Lawson, Evan Cooke, and John Wolthuis in Seattle, Washington, and San Francisco, California. Twilio is a PaaS provider (platform as a service) for cloud communication. Twilio's web service APIs allow software developers to make and receive calls automatically and send and receive text messages. Twilio services are available via HTTP and have a value for each.

i. Hardware Implementation

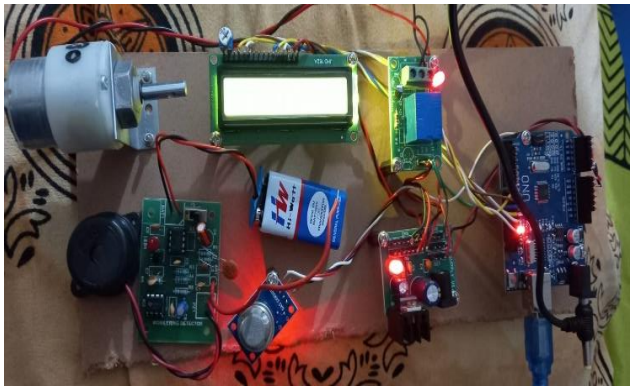

Fig -2: The Hardware Setup

Arduino: Arduino Mega is a microcontroller board based on ATmega1280. There are 54 digital input / output ports (14 of which can be used as PWM effects), 16 analogue inputs, 4 UART (hardware serial ports), 16 MHz crystal oscillator ports , USB connection, power jack, ICSP header, and reset button on this board. Comes with everything you will need to get started with a microcontroller; just connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery. Arduino IDE software used for Arduino editing.

Buzzer: A buzzer or beeper is a mechanical, electromechanical, or piezoelectric audio signalling device (piezo for short). Alarm clocks, timers, and confirmation of human input such as a mouse click or keyboard are all common uses for buzzers and beepers.

PC with OpenCV: OpenCV (Open Source Computer Vision Library) is free for both education and trading because it is licensed under the BSD license. It supports Windows, Linux, Mac OS, and Android and includes C ++, Python, and Java interface. OpenCV is created with an emphasis on real-time use and computer efficiency. The library, written in advanced C / C ++, may use multi-core processing. It can take advantage of the hardware acceleration of the sub-computer when OpenCV is enabled.

Alcohol sensor: The MQ-3 sensor will be used to detect alcohol. This is not only alcohol-resistant, but especially ethanol, a type of alcohol found in wine, beer, and alcohol. This type of sensor circuit can be used to monitor a person's level of alcohol in the blood and can also be used as a respirator. If we have alcohol in our bloodstream, we would inhale certain alcohol, just as we would inhale carbon dioxide. This alcohol concentration can be measured with any alcometer device.

Phone detector: This mobile phone detector circuit detects signals in the frequency range of 0.9 to 3GHz, allowing it to track the presence of an operational cell phone .

Ring detector: This mobile ring detector circuit helps to track the presence of an activated cell phone by the detection of the signals in the frequency range of 0.9 to 3GHz.

IR sensor: An infrared system, which consists of an infrared transmitter and a receiver, may detect an item. In more detail, an IR transmitter, also known as an IR LED, sends an infrared signal with a certain frequency that may be detected by an IR receiver.

DC Motor: A DC motor is made up of a current-carrying armature and commutator segments and brushes that connect it to the supply end. The armature is attached to the permanent or electromagnet's north and south poles. When direct current is applied to the armature, the electromagnetic action of the magnet exerts a mechanical force on it, and the motor begins to rotate.

Motor Driver: The L293D is a Motor Driver IC that allows the DC engine to rotate both clockwise and clockwise. The L293D is a 16-pin IC capable of driving two DC motors simultaneously. This IC is based on the principle of the H-bridge circuit. When the positive voltage is supplied to the motor driver, the engine begins

to rotate in one direction, and when the voltage is reversed, the motor starts to rotate in the other direction. As a result, H-bridge IC is used to drive DC motors.

5.MODULE DESCRIPTION

The system comprises of 3 phases:

1.Capturing –

 The image of the driver is captured using logitech camera, which is known for its clarity and cost effective.

 This camera creates a video clip and concentrates on single frame containing driver's eye blink.

 The captured video is then divided into frames for analyzing.

2. Detection –

This phase first involves the detection of face of the driver.

Face detection is done using facial landmark which results in locating the face in a frame.

• Only facial related structures or features are detected and all other types of objects like buildings, trees, bodies are ignored.

• In our method eye is the decision parameter for finding the state of the driver.

• Eye Aspect Ratio (EAR) is the ratio of number of eye blinks to the width of the eye.

3.Correction –

• The actual state of the eye is found, if it is closed or open or semi closed or semi open.

• The identification of eye status is most important requirement.

• A warning message is channelized if obtained eyes are in close or semi close state to a particular threshold value.

• If the systems detects that the eyes are open then it is repeated again and again until closed eyes are found.

i. Face Detection

The first step for the proposed system is to get started. A short video of the participant's face is taken using in front-facing laptop computer or any external camera connected to the system. The framework framework is used to create frames from the captured video. From this method colored frames are formed. After that these colored frames will be converted to gray scale frames by removing only part of the light. To convert colored frames into gray scale frames using light mode. The light formula says L = 0.21R + 0.72G + 0.07B.

Face detection is done using the face landmark algorithm, which results in finding the face in the frame. Only face-related structures are found and all other types of objects such as buildings, trees, bodies are ignored using this algorithm. This is done with the help of NumPy library and Dlib library. NumPy is an anaconda pack used on a sophisticated sophisticated mathematical computer and Dlib is a special kit containing machine learning techniques. . The facial marker used inside the dlib produces 68 x-y points on the face. These 68 marked points are obtained with the shape prediction algorithm. By using these points, the eye can be detected. A face marked with 68 points as shown in the picture below. As a result of those 68 points on the face, a rectangular box is calculated near the eyes which is later used in the next module to find the eye.

Fig -3: Conversion of colored frame to gray scale

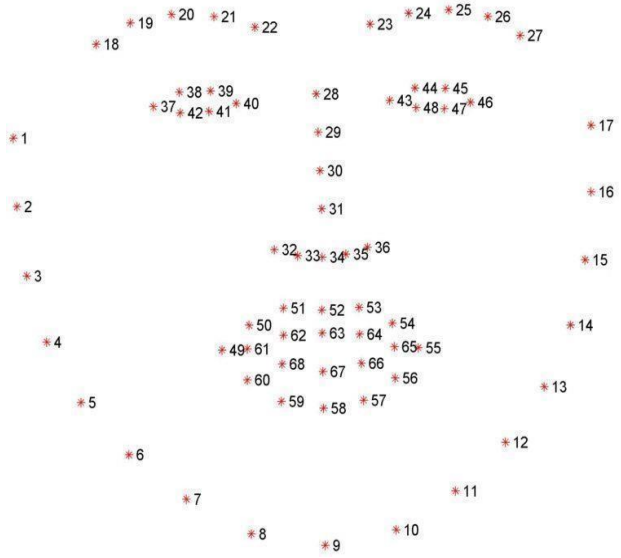

Fig -4: Identification of 68-facial coordinates using dlib library

iii. Eye Detection

In our project eye is the deciding parameter for finding the state of the patient. After the face is detected using the facial landmark algorithm a rectangular box is created around the eyes, from this we can easily concentrate on the movement of eyes like whether the eyes are open or closed. The eye region localization is the first step in this module. The located eye region from the detected face is further used for eye tracking and blink detection. The localized region is shown in the figure below.

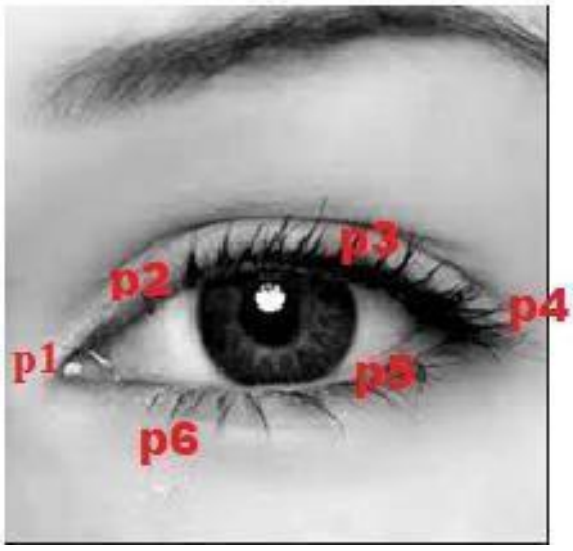

Fig -5. Coordinates of an eye

Each eye is represented by 6 (x, y)-coordinates, which start at the left-corner of a person's eye and work their way clockwise around the rest of the region. These coordinates have a relationship between their width and height. Where p1,..., and p6 are two-dimensional face landmark locations. The six points used to symbolize the eyes are shown in the diagram above. With the use of a temporal library, we are able to locate the whites of the eyes in the extracted ocular region. If the white part of the eye disappears for a period, this is referred to as a blink. With the help of the EAR, a blink detection may be calculated (Eye Aspect Ratio).

i. Eye Aspect Ratio

The following stage is to detect the eye blink when the eye is detected from the face. To detect eye blinks, we employ the Eye Aspect Ratio calculation. Instead, the eye aspect ratio is a far more elegant method that incorporates a very basic computation based on the ratio of distances between the eyes' facial landmarks. The EAR formula is shown

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

The distance between the vertical horizontal eye symbols is calculated from the value, while the distance between the horizontal eye points is calculated by the lowest number, the denominator is weighted because there are only two sets of vertical points but only one set of horizontal points. but when the eye blinks, it quickly drops to zero. An eye-recorder can be used to check if a person blinks using this simple calculation.

Look at the picture below. We have a completely open eye at the top left; the size of the eye will become larger and more stable over time. When a person blinks (top right), however, the eye rate drops sharply and closer to the egg. The eye aspect ratio graph and video clip time are set in the image below. As it can be seen, the appearance of the eye ratio remains stable, then rapidly descends to the egg, then rises again, which raises .

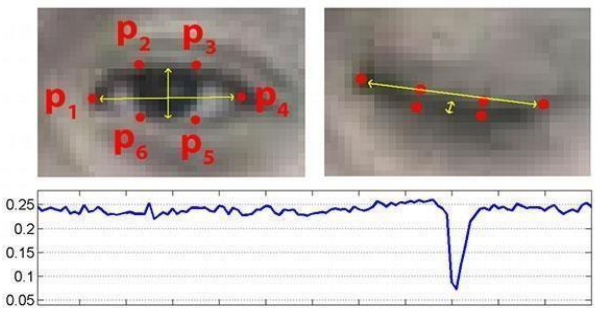

Fig -6: Graph of Eye Aspect Ratio over time for video clip

6.RESULTS

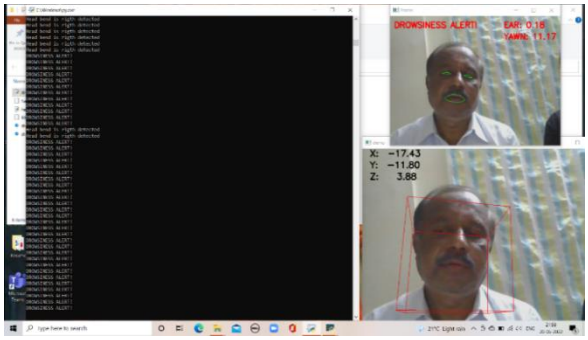

Fig -7: An alert created for drowsiness detected

Fig -8: Buzzer alert for drowsiness detection

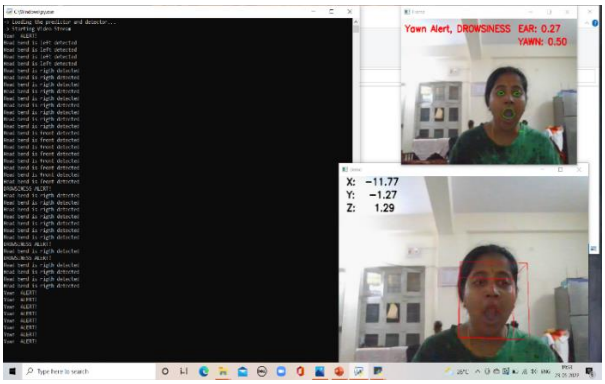

Fig-9: An alert for yawning detected

Fig -10: Buzzer alert for alcohol detection

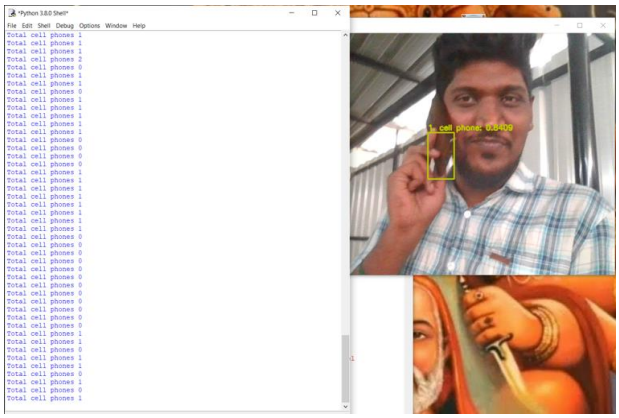

Fig -11: Mobile detection.

7. CONCLUSIONS

A driver's attention-seeking system was proposed, based on real-time fatigue detection. The proposed method identifies the blink of an eye and fatigue easily. Image processing algorithms are used to gather information about eye shape. Image processing provides an unusual way to detect fatigue without causing any discomfort or discomfort. Face recognition is done using an algorithm. It was found that this method provides a good measure of blink level. The suggested algorithm was able to detect eyeballs in medium to high light, regardless of gender or age, but the camera had to be positioned as close and forward as possible in order to be seen successfully. A night vision camera was installed to prevent the effects of incorrect detection due to insufficient light. By using the buzzer indicator to notify the driver, safe driving will be ensured. Accidents of driving under the influence of alcohol are one of the most serious problems today. This study provides the most sophisticated space available in today's world because it can be easily performed on cars with multi-stage testing, which allows us to avoid the dangers posed by drunk driving. As a result, we can reduce alcohol-related road accidents, and as a result these types of detectors will be very important in the future, which we will use with IoT. We describe the hardware configuration of IoT drives. This function is detected by the system using the ring indicator. The output of the system could be a notification to re-focus the driver's attention on the car and road only, a warning of the transport business, or the activation of the buzzer. Alcohol nerves are used to detect alcohol consumption up to a certain percentage. Automatic motion detection learning and additional features from Optical Flow such as horizontal movement, location of connected segments, and the size of the visual circuit enable mobile detection to improve the hybrid system solution. The number of frames being processed per second and image resolution also increased.

REFERENCES

[1] Data from NCRB, Government of India, available http://ncrb.nic.in/StatPublications/ADSI/ADSI2014/ADSI2014.asp

[2] "Internet of Things Global Standards Initiative". ITU. Retrieved 26 June 2015. - http://www.itu.int/en/ITU-T/gsi/iot/Pages/default.aspx

[3] Z. Xiaorong et al, ―The Drunk Driving Automatic Detection System Based on Internet of Things‖, International Journal of Control and Automation.

[4] J. Dai, J. Teng, X. Bai, Z. Shen, and D. Xuan. "Mobile phone based drunk driving detection." In 2010 4th International Conference on Pervasive Computing Technologies for Healthcare, pp. 1-8. IEEE, 2010

[5] A. R. Varma, S. V. Arote, C. Bharti, and K. Singh. "Accident prevention using eye blinking and head movement." IJCA Proceedings on Emerging Trends in Computer Science and Information Technology-2012 (ETCSIT2012) etcsit1001 4 (2012)

[6] V. Savania, H. Agravata and D. Patela , ―Alcohol Detection and Accident Prevention of Vehicle‖, International Journal of Innovative and Emerging http://en.wikipedia.org/wiki/Global_Positioning_System.

[7]http://www.dadss.org/breath-based-technology.

[8]http://en.wikipedia.org/wiki/Global_Positioning_System.

[9]http://www.dadss.org/breath-based-technology.

[10]http://www.dadss.org/touch-based-technology.

[11] S sahabiswas, S sourav, ―Drunken driving detection and prevention models using
Internet of things‖, Information Technology, Electronics and Mobile Communication Conference (IEMCON), 2016 IEEE 7th Annual, pp.1-16, IEEE,2016.

[12] Open CV 2.4.11.0 documentation; Open CV Tutorials; objdetect module;Object Detection.

[13] Viola, Jones: Robust Real-time Object Detection, IJCV 2001.

[14] Open CV Computer Vision with Python; Tracking Faces with Haar Cascades

[15] S. Motorist, Driver Fatigue is an important cause of Road Crashes, Smart Motorist.

[16] Driver Fatigue and Road Accidents: A Literature Review and Position Paper