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1. PROBLEM STATEMENT AND OBJECTIVE

Every day, millions of people around the world rely on automobiles as their primary mode of transportation. However, one significant and potentially life-threatening issue that plagues our roads is Driver Drowsiness. The problem of drowsy driving has gained increasing attention due to its role in a significant number of accidents and fatalities. In this presentation, we will explore the alarming statistics, causes, and consequences of driver drowsiness, and discuss potential solutions and technologies that can help mitigate this pressing issue.

The **primary objective** of driver drowsiness detection systems is to enhance road safety by identifying and alerting drivers who are experiencing drowsiness or fatigue while operating a vehicle. These systems aim to achieve several specific goals:

Accident Prevention: The foremost objective is to prevent accidents caused by drowsy driving. By detecting signs of driver drowsiness in real-time, these systems can intervene before a potential accident occurs.

Lives Saved: Driver drowsiness detection systems aim to save lives by reducing the number of accidents caused by fatigue-related factors. This includes preventing fatalities and injuries to drivers, passengers, and other road user.

2. ABSTRACT

Drowsy driving is a significant problem in the United States, with an estimated 83 million people admitting to driving while drowsy. This tends to cause serious accidents, injuries, and even fatalities. Every day and night, a large number of people use the highway. Taxi drivers, bus drivers, truck drivers, and people traveling long distances are all sleep deprived. As a result, the proposed system aims to reduce the number of accidents, which will increase transportation safety. Several faces and body gestures, including tiredness in the eyes and yawning, are regarded as signs of drowsiness and fatigue in drivers. These characteristics indicate that the driver's condition is poor. This study aims to examine the current state of driver drowsiness detection and evaluate the effectiveness of different methods. Machine learning techniques have been used to predict a driver's condition and emotion in order to provide information that will improve road safety. It is an artificial intelligence example in action. Basically, we're collecting a human image from the webcam and exploring how that information could be used to improve driving safety. Collect images from the live webcam stream and apply machine learning algorithm to the image and recognize the drowsy driver or not. When the driver is sleepy, it plays the buzzer alarm and increases the buzzer sound. If the driver doesn't wake up, they'll send a text message and email to their family members about their situation. Hence, this utility goes beyond the problem of detecting drowsiness while driving. Eye extraction, face extraction with DLIB. Artificial intelligence is a technique that allows systems to automatically learn and improve without being explicitly programmed.

3. INTRODUCTION

Driver drowsiness detection is a technology that aims to detect signs of fatigue or sleepiness in drivers, and alert them to take a break before they become a danger to themselves and others on the road. The problem of drowsy driving is a significant one, with the National Highway Traffic Safety Administration (NHTSA) estimating that drowsy driving is a contributing factor in about 100,000 car crashes each year, resulting in 1,550 deaths and 40,000 injuries. To combat this problem, researchers have developed various technologies for driver drowsiness detection, which can be divided into three main categories: physiological, behavioural, and environmental. Physiological methods include monitoring heart rate, respiration, and eye movements to detect signs of drowsiness. Behavioural methods include monitoring steering wheel movements, lane departure, and head position to detect drowsiness. Environmental methods include monitoring the ambient light level and the noise level in the vehicle to detect drowsiness. The goal of driver drowsiness detection is to reduce the number of accidents caused by drowsy driving and to improve road safety. It is important to note that these technologies are not a replacement for good sleep habits, regular breaks, and staying alert while driving. Rather, they are meant to be an additional layer of protection for drivers, to help them stay safe on the road. Drowsiness detection is a safety technology that can help prevent accidents caused by distracted drivers. The goal is to create a drowsiness detection system that detects when a person's eyes close for a few seconds. When drowsiness is detected, this system will notify the driver. Drowsiness detection is a safety technology that can help prevent accidents caused by drivers who fall asleep while driving. The goal is to create a drowsiness detection system that can detect when a person's eyes are closed for a few seconds. When drowsiness is detected, this system will alert the driver. According to numerous studies, drowsiness is linked to thousands of traffic accidents each year, with approximately 50% of fatalities or serious injuries , as they tend to be high-speed impacts because the driver who has fallen asleep is unable to brake or deviate to avoid or reduce impact. Manufacturers have developed drowsiness detection systems that recognise signs of possible drowsiness and alert the driver to their condition in order to reduce these accidents. This system is designed as an app for an Android-based smartphone that measures security related data without the need for additional costs or equipment. The system detects that the driver is awake 96% of the time and asleep 97% of the time. This knowledge allows you to recognise the signs of a sleepy driver.

This project employs computer vision to detect driver drowsiness. Transportation modes are becoming more advanced as technology improves and becomes more novel. Our reliance on it has begun to grow at a rapid pace. It has had a significant impact on our lives in a variety of ways. Regardless of social status, there are some rules that all vehicle drivers must follow. One is to remain alert, while the other is to be active while driving. Existing technologies for detecting driver drowsiness are either very expensive systems applicable to high-end car models or systems that are affordable but not robust. The transition from fatigued to dozing off is subtle, and the driver is usually unaware of it. This explains why it is critical to do more research in this area in order to reduce the number of accidents caused by drowsiness and motivate ourselves to become better system for detecting drowsiness. The following is a brief summary of the papers reviewed. The paper presents an arithmetic-based method for solving the problem of detecting drowsiness. There were three stages. Face detection, eye position detection, and eye tracking are the three. This paper presents an efficient method for detecting the driver's state . This framework detects the driver's state using eye movement and provides an alert within 0.5 seconds. A graph is used to represent the driver's performance. A novel method for detecting fatigue is presented These methods are used to determine whether or not the driver is fatigued. When the driver becomes drowsy, an alarm system is activated . A distinct system is designed that focuses on the concept of computer vision. A software algorithm is being created. This algorithm has been partially tested and found to be effective. A full-fledged system is being developed through research . The developed system is capable of quickly detecting drowsiness. The system can distinguish between normal eye blinks and those associated with drowsiness. . It can operate in low-light situations and when the driver is wearing spectacles. This can be improved by including additional sensors . The developed system is computer vision-based. The system makes use of both the Viola Jones algorithm and the CAMSHIFT algorithm . This paper is about the creation of a software framework for the accurate and timely detection of drowsiness. As inputs, several facial features were considered . The paper proposes a method for detecting drowsiness based on angular velocity time series analysis of the steering wheel. This method has a number of advantages over the traditional method. It categorizes drowsiness detection methods into two types. They are divided into two categories: driver and vehicle. It also offers an overview of various driver and vehicle-based techniques. A drowsiness detection system is developed that is based on an algorithm known as the "shape predictor algorithm" and eye blink rate. It is based on the image processing concept. The system employs a non-invasive method. This system also suggests

using yawning as a parameter to detect drowsiness . Certain facial features were identified in order to estimate a driver's condition. They were investigated using Python libraries. These characteristics were the rate of eye closure, ECD, per closure, head positions, and yawning rate. Some limitations were also mentioned .

The drowsiness of driver and impact of collision monitoring or alert system is constructed using IoT technology .For finding the fatigue or sleepiness of driver, a camera can be used during driving. Apart from it, the vehicle needs to be well mounted by crash sensor and FSR sensor for detecting the extremity of collision. When the drowsiness is detected, the driver is alerted by voice speaker and a mail sent to the vehicle owner. Similarly, suppose any sudden collision happens due to drowsiness. In that case, the data collected from the sensors and the alert message are messaged to the nearer hospitals nearby the prone location from Google Maps link where the mishap has happened. The rest of the paper has been organised as follows: in Section 2, the literature review is included. Section 3 describes about components which are used for designing the proposed system. Section 4 illustrates the proposed system with a block diagram along with a brief explanation of the methodology with a flowchart in Section 5. The result analysis is discussed in Section 6. Finally, a conclusion of the paper with its future work is detailed in Section 7. Driver drowsy detection systems have emerged as a solution to combat the dangers of fatigue-related accidents. These systems leverage cutting-edge technology, such as computer vision, machine learning, and physiological monitoring, to monitor a driver's state and assess their level of alertness. By continuously analysing various data inputs, these systems can identify signs of drowsiness, such as erratic steering, slow reaction times, or drooping eyelids.

4. LITERATURE REVIEW

Drowsiness of driver can be determined with different aspects using vehicle-based, psychological, and behaviour measurements implemented through different predictive algorithms as discussed in the following sections.

4.1. Face and Eye Detection by Machine Learning (ML) and Deep Learning (DL) Algorithms. Jabbar et al. [2] proposed Convolutional Neural Network (CNN) technique of the ML algorithm to detect microsleep and drowsiness. In this paper, detection of driver's facial landmarks can be achieved through a camera that is then passed to this CNN algorithm to properly identify drowsiness. Here, the experimental classification of eye detection is performed through various data sets like without glasses and with glasses in day or night vision. So, it works for effective drowsiness detection with high precision with android modules. The algorithm of Deep CNN was used to detect eye blink and its state recognition as provided by Sanyal and Chakrabarty [12]. Saleh et al. developed an algorithm of LSTM and Recurrent Neural Networks (RNN) to classify driver's behaviours through sensors. Ed-Doughmi et al. [14] analysed the driver's behaviours through the RNN algorithm. It specially focuses on construction of real-time fatigue detection to prevent roadside accidents. This system formulates a number of drivers' faces, which works on multilayered 3D CNN models to identify drowsy drivers and provide 92 percentage acceptance rate.

4.2. FPGA-Based Drowsiness Detection System. A low intrusive drowsiness detection system using field programmable gate array (FPGA) has been designed by Vitiable et al. [15]. This system focuses on bright pupils of eyes which are detected by IR sensor light source embedded in a vehicle. Due to this visual effect, the retinas. identified up to 90%, which helps to find drivers' eyes for analysing drowsiness through a number of frames for avoiding serious mishaps. Navaneethan et al. [16] implemented a real-time system to track human eyes using cyclone II FPGA.

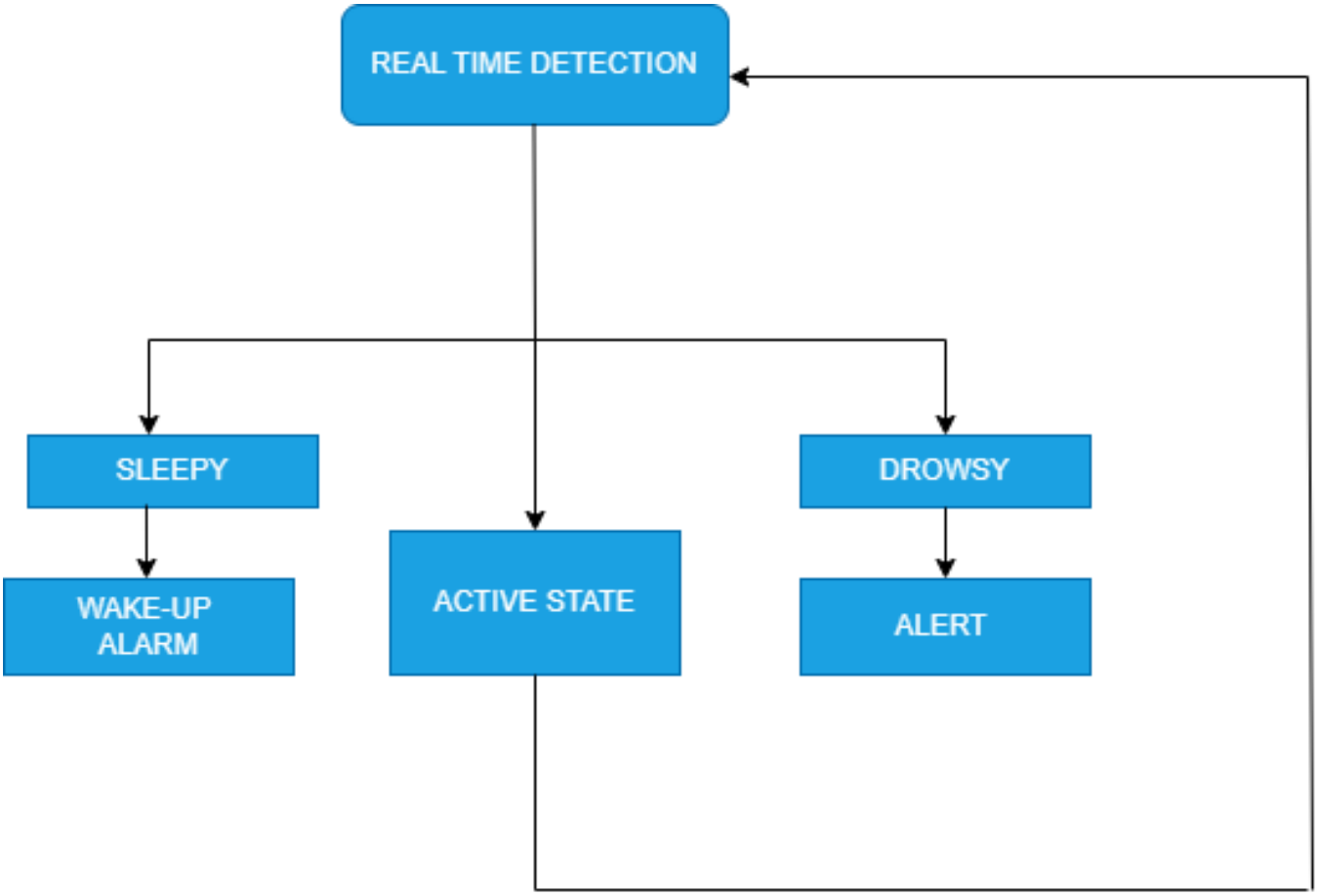
4.3. Eye Recognition System Based on Wavelet Network Algorithm. Jemai et al. [17] introduced a technique for drowsy warning system using wavelet networking. That network tracks eyes with the help of classifying algorithms like Wavelet Network Classifier (WNC) that relies on Fast Wavelet Transform (FWT), which specifically leads to binary way decision (conscious or not). The physiological aspects are heart beat rate and electrocardiogram that are repeatedly extracted through wavelet transformation with regression technique for fatigue detection, designed by Babaeian et al. [18]. This principle worked on heart rate data classification through wavelet network which can find an average way of drowsiness alert system.

4.4. Fatigue Detection Using Vehicle State (Steering Wheel) Algorithm. Arefnezhad et al. [19] proposed a noninterfering drowsy detection system based on vehicle steering data using neuro fuzzy system with support vector machine and particle swarm optimization algorithm. Mutya et al. [20] established a system to resolve the problem of drowsiness using steering wheel algorithm. It is basically based on image-formed or pictorial-based steering movement and the CNN algorithm for proper classification of drowsiness, which can also reduce false drowsy detection rates.

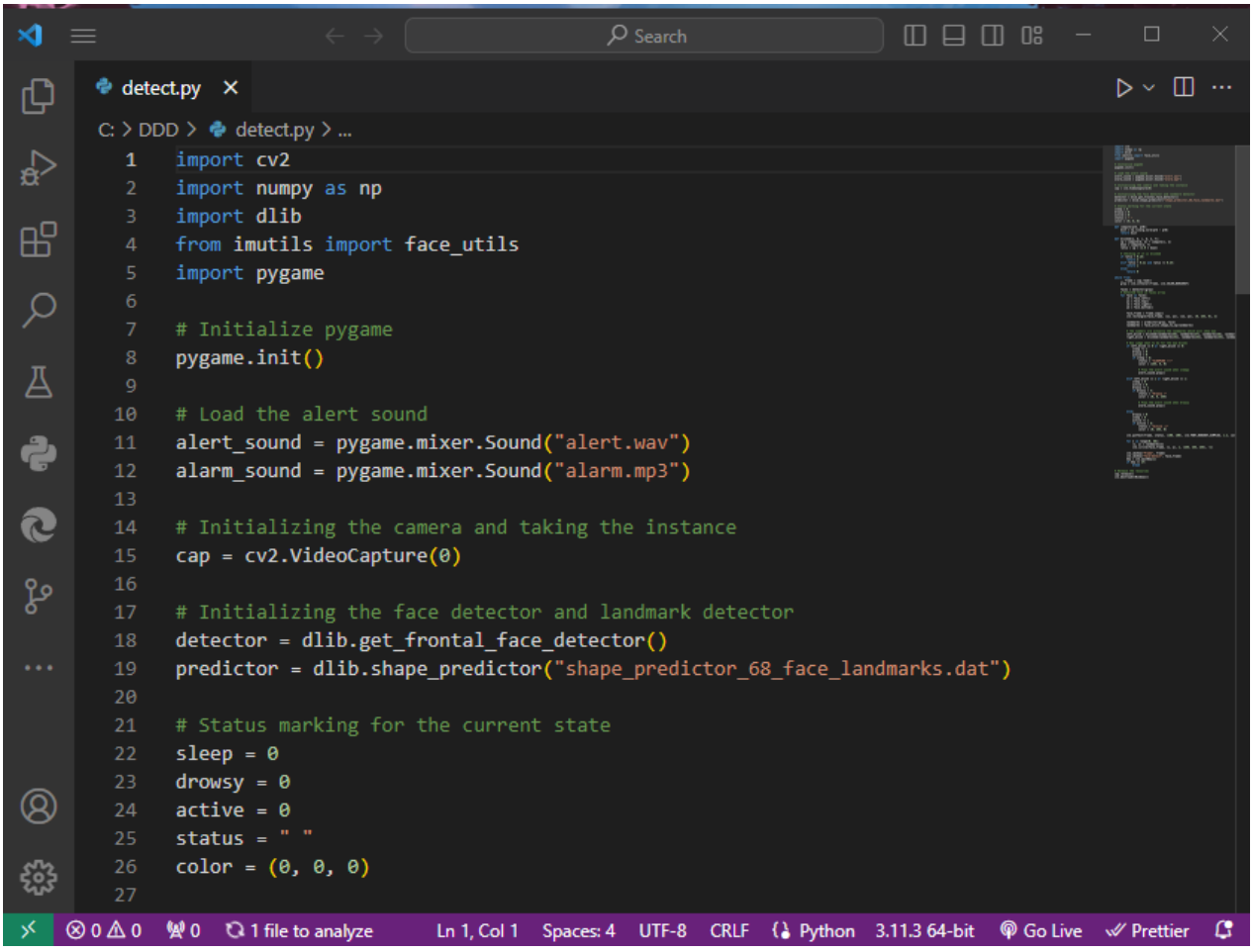
4.5. Drowsy Alert System Designed Using Electroencephalography (EEG), Electrocardiography (ECG), Electrooculogram (EOG), and Electromyogram (EMG) Algorithm. Budak et al. [21] designed a drowsy detection system through EEG technique which is designed with various components like AlexNet method, VGGNet method, and wavelet transform algorithm. This process effectively analyses the state of sleepiness using the brain indicator signal (EEG), camera, and sensors that are activated with the help of machine learning method to alert drowsy driver. Hayawi and Waleed [22] proposed a method to observe drowsiness through signal of Heart Rate Variability (HRV) which is obtained using EEG sensors. Hayawi and Waleed [23] established an intrusive method for measuring eyeball movement using EOG technique to construct a fatigue alert system that is also embedded with an Arduino controller board with K Nearest Neighbors (KNN) classifier to improve the percentage of accuracy. Song et al. [24] proposed a system to identify the fatigue of driver through the movement of muscular skin of eyes which is processed using EMG sensors with the help of a human machine interface. Similarly, the closure of eyelids and muscle part movements are also observed through the EMG sensors signals that function with the help of ESP8266 to provide or monitor the drowsy data on the Internet, which is designed by Artanto et al. [25]. designed a driving fatigue detection system by measuring the EEG signals. It provided a robust platform for detecting. drowsiness which is based on a deep learning process to find the accuracy of fatigue through EEG signals. But the deep learning process is structured through a principal component analysis network (PCANet) that preprocesses EEG data to create accuracy of detection. This process was tested in small sample size and offline mode, but it violates the accuracy in a large population of samples in real-time situations. Due to that reason, the IoT module is used to test online or offline in large sample sizes. Ma et al. [27] proposed an efficient application for the detection of driver fatigue through facial expression. Here, the facial movement is observed by deep learning of multiblock local binary patterns (MB-LBP) and AdaBoost classifier. But it is also used to accurately and quickly detect drowsiness with the help of a fuzzy inference system. When the driver wears a glass, then the accuracy of detection is decreased. So IoT modules are used to make it more intelligent and to improve accuracy level of fatigue detection.

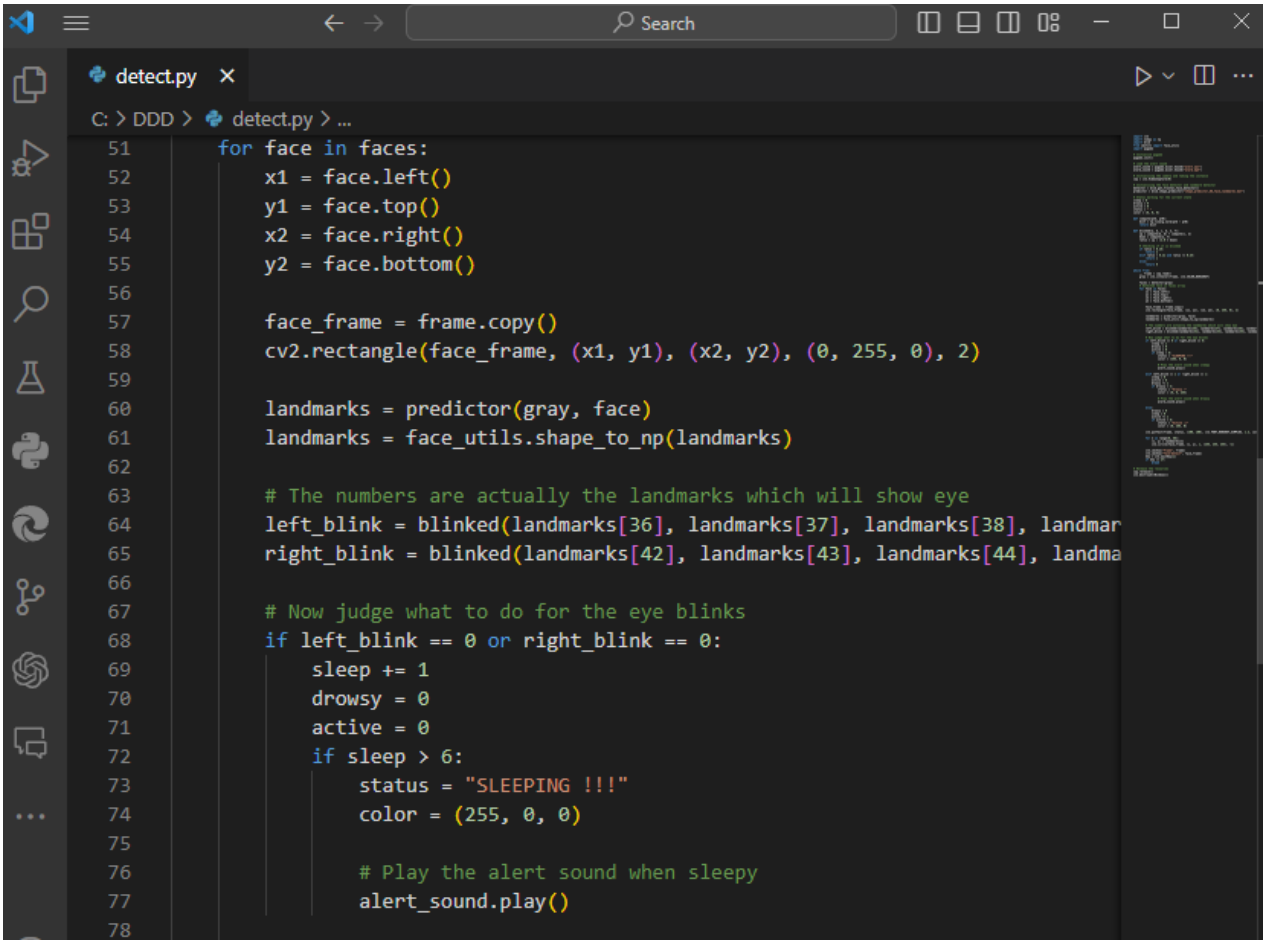
4.6. Fatigue and Collision Alert System Using Smart Technique. Chen et al. [28] implemented a smart glass to detect fatigue. The rear light of the vehicle is automatically flashed with a message being sent using the IoT module or cloud environment. Kinage and Patil [29] proposed a system to detect the drowsiness using eye blinking sensors and any accidents or collisions that happened; then, the vibration sensor was integrated with heart rate measurement sensor for forwarding alert message to the authorized user. So, it is also attached to the GPS and GSM device for tracking the location and transmission of message. Siva Reddy and Kumari [30] introduced a system to control cause of unconditional mishaps using Arduino board with sensors which operated through camera. But, it is an efficient system with less estimation cost for construction of it. Jang and Ahn [31] implemented a system to detect an alcohol addict and drowsy drivers through sensors, where these elements are integrated with the Raspberry Pi controller module. So, the IoT modules are also used to send messages for any abnormal driver activities, which are properly invigilated with the help of a webcam (image processing) and controller unit. A new process has been developed for regular vigilance of facial detection and eye blink state, which predicts the driver's drowsiness. In addition to extra sensors, voice recognition application and machine learning methods are used to enhance the process of alert [32]. In the existing system, the fatigue of the driver is calculated through the eye or facial movements, deep learning, FPGA-based, ECG or EEG or EOG, vehicle steering movement, etc. But the implementation of the IoT-based technique helps to smartly control the various issues of driver drowsiness by the automatic buzzing of alarm, easily tracing the mishap location, and warning to the owner by sending emails or messages.

5. METHODOLOGY (Diagrams)

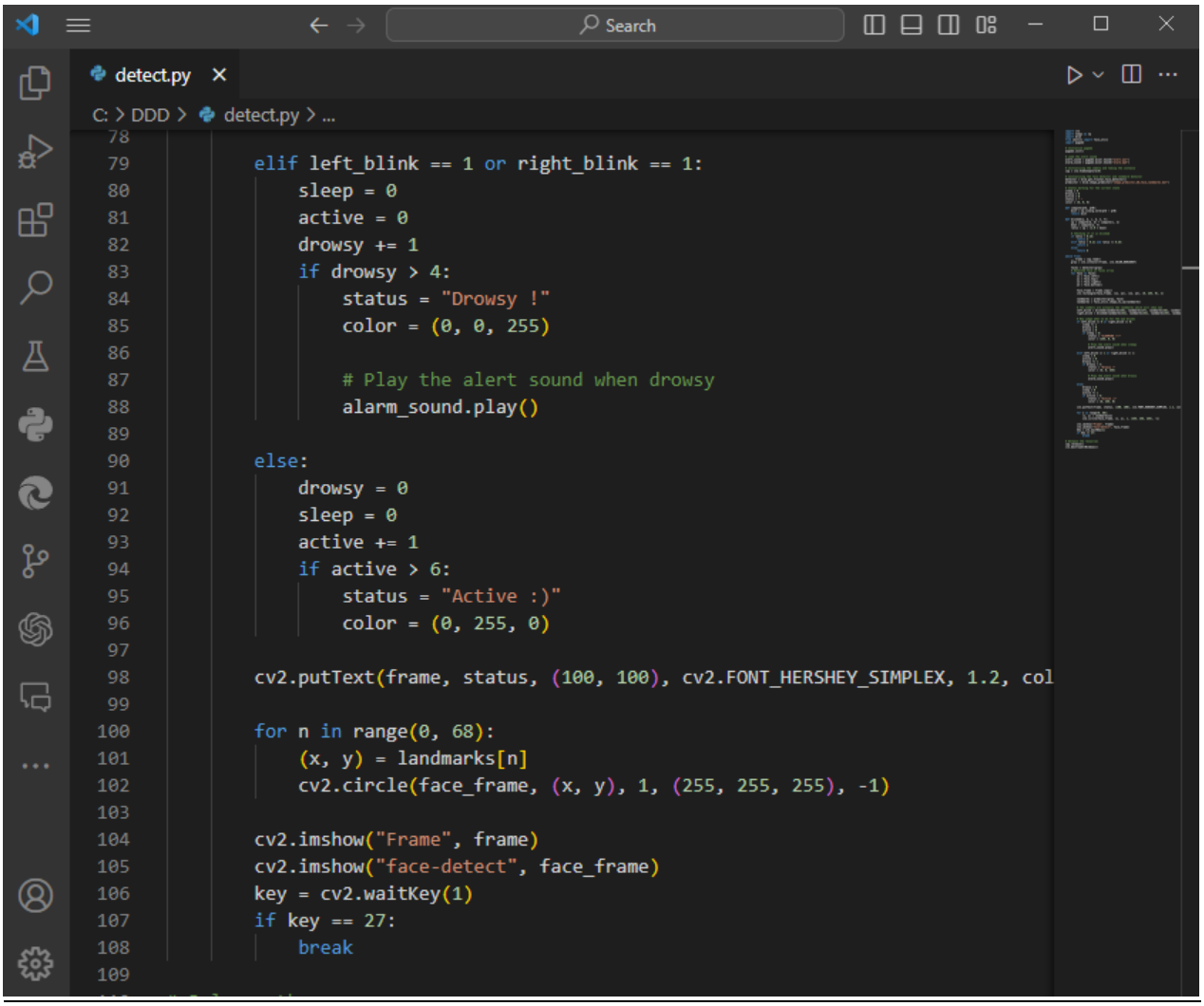


6. IMPLEMENTATION & RESULT






```python
    for face in faces:
        x1 = face.left()
        y1 = face.top()
        x2 = face.right()
        y2 = face.bottom()

        face_frame = frame.copy()
        cv2.rectangle(face_frame, (x1, y1), (x2, y2), (0, 255, 0), 2)

        landmarks = predictor(gray, face)
        landmarks = face_utils.shape_to_np(landmarks)

        # The numbers are actually the landmarks which will show eye
        left_blink = blinked(landmarks[36], landmarks[37], landmarks[38], landmar
        right_blink = blinked(landmarks[42], landmarks[43], landmarks[44], landma

        # Now judge what to do for the eye blinks
        if left_blink == 0 or right_blink == 0:
            sleep += 1
            drowsy = 0
            active = 0
            if sleep > 6:
                status = "SLEEPING !!!"
                color = (255, 0, 0)

                # Play the alert sound when sleepy
                alert_sound.play()

```




```python
        elif left_blink == 1 or right_blink == 1:
            sleep = 0
            active = 0
            drowsy += 1
            if drowsy > 4:
                status = "Drowsy !"
                color = (0, 0, 255)

                # Play the alert sound when drowsy
                alarm_sound.play()

        else:
            drowsy = 0
            sleep = 0
            active += 1
            if active > 6:
                status = "Active :)"
                color = (0, 255, 0)

        cv2.putText(frame, status, (100, 100), cv2.FONT_HERSHEY_SIMPLEX, 1.2, col

        for n in range(0, 68):
            (x, y) = landmarks[n]
            cv2.circle(face_frame, (x, y), 1, (255, 255, 255), -1)

        cv2.imshow("Frame", frame)
        cv2.imshow("face-detect", face_frame)
        key = cv2.waitKey(1)
        if key == 27:
            break

```

7. CONCLUSION

This research provides a robust method for detecting drowsiness of drivers and collision impact (severity) system in the present time. This method generally combines two different systems in one integrated system. But, the existing techniques are based on psychological or vehicle based approach to detect drowsiness of drivers and also, the severity of collision is separately measured, but such technique is highly intruding as well as fully turns on the physical environment. So, the proposed system is used to construct a non-intruding technique for measuring drowsiness of the driver with severity of collision due to braking or mishap. Camera module that are used for persistent recording of face landmarks that are localized through facial landmark points then to calculate EAR. However, if the calculated EAR value increases from the threshold range, then the eyes are kept open and no change in the state of system occurs. Similarly, if the EAR value falls from the threshold range, then the system urgently alerts using speech speaker and warning e-mail to the authority (owner) for extra supportive alertness to the driver. In addition, measurement of collision severity (impact) is made through implementation of sensors with the GPS module to properly track the location of accident thereby alerting the nearer medical service centre to serve emergency diagnosis. This paper conducts a comparative analysis of papers on drowsy driver safety detection. The system detects signs of fatigue or sleepiness in drivers by detecting eye movement, and alerts them to take a break before they become a danger to themselves and others on the road. A camera is used to detect several faces and body gestures, including tiredness in the eyes and yawning, which are regarded as signs of drowsiness and fatigue in drivers. This is done to identify the drowsiness symptoms in order to avoid accidents.

FUTURE SCOPE

● The system can be made more accurate using various other parameters such as State of the Car, Detecting Foreign Substances on Face etc.

● An application can be developed where it can alert or prevent the user from sleeping.

● It can be used to develop an IOT device that can be installed in the car to detect driver’s drowsiness.

● Record individual drivers' drowsy steering activity.

● Perform additional simulator experiments to validate the algorithm, test additional road conditions, and test a more diverse group of drivers;

● Test and refine the algorithm based on road test data; and conduct research on warning systems integrated with the detection system

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