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Driver Drowsiness Detection and Alert Generating System

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Abstract:- Driver drowsiness detection and alert generating system is a form of artificial intelligence that practices machine learning algorithms to detect signs of drowsiness in drivers. This technology typically involves sensors such as cameras, microphones, and accelerometers that track the driver's behaviours, such as head position, eye movement, and yawning, and then use machine learning algorithms to detect patterns of drowsiness. The technology can then alert the driver if they are at risk of dozing off, helping to reduce the risk of accidents or dangerous driving behaviour. A machine-learning approach to detect drowsiness in drivers using facial landmarks. The planned system uses a convolutional neural network (CNN) to observe the facial features of a driver in real-time and then compares them with a set of predefined features associated with drowsiness. The system can then alert the driver of their drowsiness by sounding an alarm or displaying a warning message. The planned method can be used in various applications, such as driver assistance systems, autonomous vehicle systems, and public safety systems. Lastly, we outline the issues that current systems confront and discuss the associated research prospects.

Keywords:- *Machine Learning, Autonomous Vehicle Technology, Yawn Detection, Driver Drowsiness Detection, Image-Based Measures.*

I. INTRODUCTION

Drowsiness detection and Alert Generating systems are designed to observe signs of exhaustion and drowsiness in drivers, alerting them to the fact that they need to rest or take a break from driving. A drowsiness detection system typically consists of a camera, machine learning algorithms, and an alert system to inform the accident area to ambulance driver. The system works by monitoring the driver's behaviours and expressions, such as eye blinking frequency and yawning, and comparing it to a predetermined baseline. If the driver's behaviours deviate from the baseline, the system will alert the driver of their fatigue and suggest that they take a break. For this process, we use machine learning algorithm. We used the haar cascade algorithm The Haar Cascade technique is used to recognise objects in pictures. It is a machine learning approach in which a cascade function is taught using a large number of positive and negative images. Then it's used in other photos to detect things. The Haar Cascade algorithm is commonly used for face detection and recognition. It is also used for driver drowsiness detection. In driver drowsiness detection, the Haar Cascade algorithm is used to observe the face of the driver and then analyze the facial expressions. If the facial expressions indicate that the driver is drowsy or sleepy, an alarm is triggered. This alarm alerts the driver and prevents him/her from falling asleep while driving, thus avoiding accidents. Drowsiness detection and alert -generating systems can be beneficial in reducing the number of accidents caused by fatigued drivers, as well as improving driver safety. The process for a drowsiness detection and alert system typically involves the system capturing pictures of the driver's face using a camera, Computer vision algorithms process the images to detect and track facial features such as the eyes, eyebrows, and mouth. The system computes a baseline of the driver's behaviours from the facial features. The system observe the driver's behaviours over time and compares it to the baseline. If the driver's behaviours deviates from the baseline, the system will alert the driver of their fatigue and suggest that they take a break. If unfortunately accident is occurred than the system also can alert emergency services like ambulance if the driver got

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severe injuries. This can be done by sending a GPS location to the emergency services. If the driver got injuries due drowsiness, then with help of developer API of ambulance booking and tracking application, send location of that car to nearby ambulance drivers to rescue the people. For this process we use API technology. APIs are collections of descriptions and rules that enable software components to communicate and interact with one another via a simple array of commands. APIs serve as messengers, delivering a request from one application to another and returning an answer in real time. Using this method only ,we are send location of area where the accident is occur to driver of the nearby ambulance.

II. LITERATURE SURVEY

In 2008, Hong Suet.al. described 'A Partial Least Squares Regression-Based Fusion Model for Predicting the Trend in Drowsiness was proposed to manage with the problem of strong collinear relations among eyelid movement features. The predictive accuracy and strength of the model were validated, which showed that it provided a different way of combining multi-features for enhancing our capability of detecting and predicting the state of drowsiness '.

In June 2010, Bin Yang et. al. described that measures of the driver's eyes can be used to detect drowsiness under a trainer or experimental conditions. The performance of the latest eye-tracking-based in-vehicle exhaustion prediction measures is evaluated. These measures are evaluated statistically and by a classification method based on a large dataset of 90 hours of real road drives.

In 2011, M.J. Flores et. al. described a 'Driver drowsiness detection system under infrared illumination for an intelligent vehicle is proposed to reduce the number of fatalities in collisions caused by driver drowsiness. A module for an advanced driver assistance system, which caters to automatic driver drowsiness detection and driver distraction, is presented as a solution. To compute the drowsiness and distraction indexes, artificial intelligence algorithms process visual information to locate, track, and analyse both the driver's face and eyes. As a result of a near-infrared lighting system, this real-time system operates during the night. Finally, examples of various driver images captured in a real vehicle during the night are shown to validate the proposed algorithms.

In June 2012, A. Cheng et. al. described 'Driver Drowsiness Recognition Based on Computer Vision Technology'. They demonstrated a non-invasive drowsiness detection method based on eye tracking and image processing. A robust eye detection algorithm is introduced to address the issues caused by changes in brightness and driver posture addresses, and a sturdy eye detection algorithm is introduced. The percentage of eyelid closure, highest closure duration, blink frequency, the average opening level of the eyes, starting velocity, and closing velocity of the eyes all are calculated. To reduce interrelations and retrieve an unbiased index, these measures are merged using Fisher's linear discriminated functions stepwise manner. The results of six participants in driving prototype experiments show that this video-based drowsiness recognition technique can be implemented with 86% accuracy.

In 2013, G. Kong et. al. described 'Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring'. They proved a visual examination of eye state and head pose (HP) for constant monitoring of a vehicle driver's awareness. To evaluate the driver's drowsiness or diversion level, most conventional techniques to visual identification of non-alert driving structures depend on either eye closure or head nodding angles. The proposed scheme obtains critical information on a vehicle driver's non-alertness using image features such as eye index (EI), pupil activity (PA), and HP. A support vector machine (SVM) identifies driving events as alert or non-alert based on a sequence of video frames. In real-world driving conditions, experimental outcomes indicate that the suggested scheme provides a high degree of precision with acceptable errors as well as false alarms for individuals of different ethnicities and genders.

In June 2014, Enosis's et. al.described 'Driver Drowsiness Detection through HMM based Dynamic Modelling'. They suggested an innovative approach for detecting drowsiness by analyzing the driver's facial expression using Hidden Markov Model (HMM)-based dynamic modeling. They used a driving simulation setup to implement the algorithm. The efficiency of the suggested approach was confirmed by experimental results.

In August 2014, García et. al. [21] described 'Driver Monitoring Based on Low-Cost 3-D Sensors'. They demonstrated a method for driving surveillance and incident detection method based on 3-D data from a range camera. To enable head position estimate and region-of-interest recognition, the system integrates 2-D and 3-D approaches. The points belonging to the heads are detected and extracted for even further analysis based on the acquired cluster of 3-D pixels from the sensor and examination of the 2-D projection. The iterative closest points approach is then used to estimate head posture with a total of three freedom degrees (Euler angles). Eventually, significant facial areas are selected and used for additional analysis, such as action recognition and behavior analysis. The final application is a low-cost 3-D driver surveillance system.

III. METHODOLOGY

The methodology for a driver drowsiness detection and alert generation system can be divided into five stages.

A. System Overview:

The aim of a drowsiness detection system is to observe a driver's alertness level and alert them if they are becoming too drowsy so that they can take appropriate action to avoid a fatigue-related accident. If unfortunately accident is occurred than the system also can alert emergency services like ambulance if the driver got severe injuries. This can be done by sending a GPS location to the emergency services

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This is typically achieved by using a combination of cameras, sensors, image processing algorithms to detect signs of drowsiness, such as yawning, head nodding, and eye closure, and API. The system is developed with help of machine learning algorithm like haar cascade algorithm. Haar cascade algorithms are a form of computer vision widely used for detecting objects in an image or video. It is a machine-learning approach in which a cascade function is taught using a large number of both positive and negative images. Then it's used in other photos to detect movement. Using algorithm, we can easily detect drowsiness. Developer API is also used to share the location of accident are to the ambulance driver .

B. Collecting Data:

The first step in developing a driver drowsiness detection system is to collect data. This data should include images or videos taken from a vehicle that captures the driver in different states of drowsiness including open eyes, closed eyes, yawning, and nodding off. For collecting data we used observation technique which is used to collect moment of driver .we used two types of observation .there are;

- Structured Observations: Structured observations involve setting a predetermined set of behaviours to observe and record. For example, a researcher might set out to observe and record how often a teacher smiles during a lesson.
- Unstructured Observations: Unstructured observations involve observing and recording behaviours without any predetermined set of behaviours. For example, a researcher might observe and record all of the behaviours that a student displays while they are in a classroom.

C. Pre-processing Data:

After the data has been collected, it needs to be pre-processed. This involves cleaning the data and removing any noise from the images or videos. Additionally, the data should be labelled according to the driver's state of drowsiness. We use some techniques to processing data. There are

- Data Cleaning: This involves identifying, correcting, and removing inaccurate or incomplete data.
- Data Transformation: This involves transforming data from one format to another in order to make it more useful for analysis.
- Data Reduction: This involves reducing the size and complexity of the data in order to make it more manageable and efficient to use.

By these techniques ,we built a complete dataset which used in our system

D. Feature Extraction:

After the data has been pre-processed, the next step is to extract features from the data. This involves extracting important characteristics from the images and videos that can be used to identify drowsiness. Examples of features that can be extracted include eye opening, eye closing, and yawning. For this we used deep learning technique.

Deep learning can be used to extract features from audio, images and videos. It can be used to detect patterns and learn latent features that can be used to classify data and make predictions. In audio, deep learning can be used to extract features like pitch, frequency, and rhythm. In images, it can be used to detect edges, shapes, and textures. In the video, it can be used to identify objects, recognize faces, and track motion. Additionally, deep learning algorithms can be used in feature extraction, such as dimensionality reduction, clustering and non-linear transformations. Using this technique ,we extract the particular part of driver face which is used to find drowsiness .

E. Modelling

Once the features have been extracted, the next step is to create a model that can accurately detect drowsiness. This can be done using machine learning algorithms such as convolutional neural networks Convolutional neural networks (CNNs) are a kind of deep learning neural network that is used for image recognition and computer vision tasks. They are based on the idea of how a human brain processes information by using a set of filters and feature detectors. Using CNN, we predict drowsiness.

IV. IMPLEMENTATION

Driver drowsiness detection is a system that can detect when a driver is falling asleep or is otherwise impaired due to fatigue or intoxication. This system uses various sensors, such as cameras, to monitor the driver’s facial expressions, eye movements, and other physiological signals. When the structure detects any variations in the driver’s behaviours that indicate drowsiness, it can alert the driver to take a break or pull off the road. The system proposed in the IEEE paper utilizes a combination of a camera and a facial recognition algorithm. The camera captures images of the driver’s face which are then analysed by the algorithm to detect any variations in facial expressions and eye movements that may indicate drowsiness. If a change is detected, the system can alert the driver to take a break or pull off the road. The system also utilizes several other sensors, such as accelerometers and gyroscopes, to measure the driver's head movements. If the head movements indicate that the driver is falling asleep, the system can alert the driver to take a break or pull off the road. The system also utilizes an EEG headset to measure the driver's brainwaves. This allows the system to detect changes in the driver's brainwaves that may indicate fatigue or intoxication. If any changes are detected, the system can alert the driver to take a break or pull off the road. The system also can alert emergency services like ambulance if the driver got sever injuries. This can be done by sending a GPS location to the emergency services. We followed the following steps:

Step 1: Install and launch the OpenCV library.

Step 2: Capture the video frames from the camera and detect the face in each frame.

Step 3: Estimate the perspective ratio of the face also apply the aspect ratio-based blinking algorithm.

Step 4: If the duration of the blinks is less than a threshold value, then the driver is considered to be sleepy and awareness should be sent to the driver.

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Step 5: If the driver does not respond to the alert, then an emergency alert should be sent to the specified contact list.
Step 6: Finally, the system should be able to notice the driver's fatigue levels also alert the driver accordingly.
Step7: If the driver got injuries due drowsiness, then with changes in developer api like ambulance booking and tracking application, send location of that car to near by ambulance drivers to rescue the people .

V. FLOWCHART

The most important modeling tool is the data flow chart (DFC). It's used to simulate the system's components. The mechanism, the data used by the methodology, an external entity that communicates with the system, and the data moves in the system are the components.

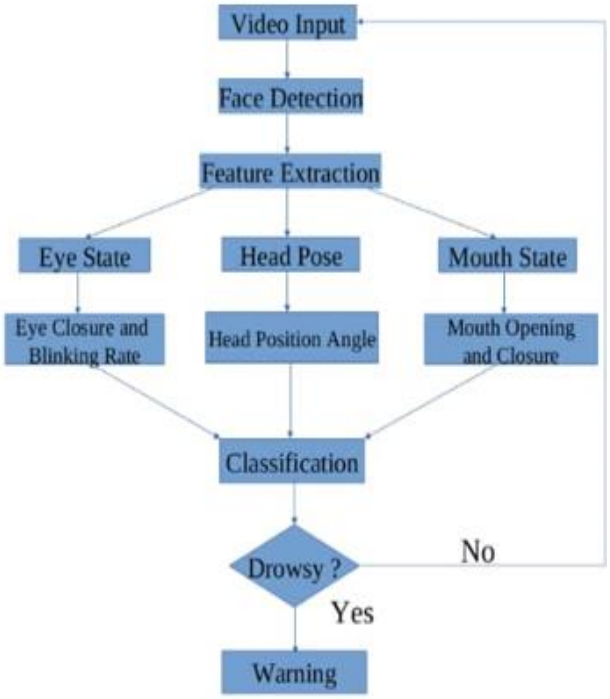

Fig 1 Data Flow Chart (DFC)

VI. RESULT AND DISCUSSION

We are going to fit our camera into vehicles and, using software, we are going to detect drivers' facial reactions. If the driver is in sleepy mode, an alarm will blow to alert the driver to wake up. It's more useful for drivers to escape from accidents. It helps fully to save drivers' lives. Nowadays, we are facing many accidents to avoid implementing driver drowsiness detecting systems. The budget for our projects is less expensive. We are only going to spend money on cameras. We are going to fit steering in vehicles to detect driver-face reactions. We are facing issues with the project, installing the project, and importing it. We can also do the project using IoT. It is more expensive and complex to implement. Then we are fitting cameras into drivers' bodies to detect the action of drivers. It affects the driver's body. It is also uncomfortable for drivers. Compared to Iot, the project is better to implement and has less cost**.** It is clear that although the use of this project driver drowsiness detection system is to save the drivers' lives In this research, we present a paradigm for locating driver fatigue in the context of communication-ready execution. The mechanism is made up of three major sections: a camera, a facial recognition algorithm, and a message alert. The camera captures video frames of the driver's face and sends them to the facial recognition algorithm. The facial recognition algorithm detects drowsiness in the driver by analyzing the facial features of the driver. The message alert is triggered when the facial recognition algorithm detects drowsiness in the driver, and it sends an aware message to the driver's phone or other devices to alert them of the condition. In addition, the structure can be combined with other current vehicle safety systems, such as lane departure warning systems, to further improve the safety of the driver. We evaluate our system with real-world data and compare it with existing methods. The results show that our proposed system can detect drowsiness in drivers with high accuracy.

VII. CONCLUSION

The use of drowsiness detection systems in vehicles is an important development in the field of automotive safety, as it can contribute to lowering the number of collisions caused by drivers who become distracted or sleepy while driving. In this paper, we present a summary of the existing drowsiness detection systems and discuss their advantages and limitations. We then propose an improved drowsiness detection system that uses a mixture of many sensors and machine learning algorithms to notice the onset of drowsiness in drivers. Our proposed system is designed to be robust and accurate, while also being affordable and easy to use. Finally, we conclude our paper by discussing potential future directions for this technology, including the development of more advanced sensing and machine learning algorithms that can detect more subtle signs of drowsiness, as well as the use of this technology in the development of autonomous vehicles.

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