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Drowsiness Detection of Driver

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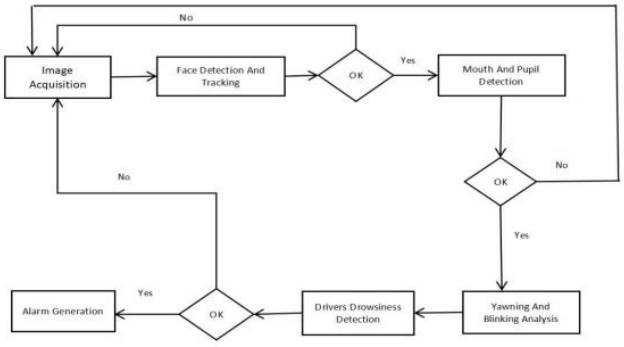
Abstract: *Today Many car accidents are caused in significant part by driver weariness. According to recent figures, fatigue-related collisions result in 1,200 fatalities and 76,000 injuries per year. The evolution of the development of technologies for detecting and avoiding drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the risk that drowsiness presents on the road, methods need to be developed for prevent its affects. The goal of this project is to develop a prototype drowsiness detection system. The focus is on designing a system that will correctly monitor the open or closed state of the drivers eyes in real-time. By observing the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of drowsy involves a pattern of images of a face, and the observation of eye movements and blink rate. The analysis of face images is a popular research area with applications such as face recognition, virtual tools, and human identification security systems. This project is used the localization of the eyes, which involves looking at the image of the face, and deciding the position of the eyes by developing matlab program. Once the position of the eyes is located, the system is designed to decide whether the eyes are opened or closed, and detect drowsiness. The purpose of this study is to detect drowsiness in drivers to prevent accidents and to improve safety on the highways.*

Keywords Drowsiness detection

I. INTRODUCTION

The main factors that lead to road accidents are fatigue and drowsiness, which can be avoided by taking effort to get proper rest before driving, drinking energy drinks or coffee, or taking a break when a person feels drowsy. Some popular methods that detect drowsiness use ECG and EEG, which are very complex. The fact that these approaches are very precise, they require human involvement and have limitations that make them unsuitable for real-time driving. We're working on a technique to detect sleepiness in drivers by having them yawn while they're driving. The technology recognized the face in the video picture. To narrow down the system's ability to identify the eyes and mouth inside the face region, the face area is detected and used. Detecting the lips and eyes is the next step after finding the face. Also, the criteria for identifying the lips and the eyes are produced within the facial image, as well. To detect the eyes and lips, the movie is converted into picture frames per second. It is possible to tell if the eyes are open or closed after they've been found by monitoring the eye aspect ratio.

II. BLOCK DIAGRAM



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2.1 System Overview

In this project, we use a camera to obtain the real time video of the driver and convert that to video frames, these video frames are examination to detect faces and check if the driver is in a drowsy condition basing on the facial quality. If the driver is drowsy he will be alerted by the system. This method is an efficient way to detect the drowsiness compared to existing methods as there are no external conditions are considered. The hardware requirement is also minimal.

III. SOTWARE USED

A. Python: Python is object oriented programming based, high level, interpreted programming language. Python helps in easy writing and execution of code. Python has a lot of libraries for every need of these project. For jarvis, libraries used are speech recognition to recognize voice, Pyttsx3 for text to speech, selenium for web automation etc.

B. Image Processing

In computer science, digital image processing is the use of computer algorithms to perform image processing on digital images.

C. Machine Learning

Machine learning is the scientific study of algorithms and statistical models that computer systems use in order to perform a specific task effectively without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly told.

IV. WORKING

we initialized the dlib's face detector model as 'detector' and the indicator predictor model as 'predictor'. The face is detected. we try to detect the facial landmarks in the face using the dlib's landmark predictor. The landmark predictor returns 68 (x, y) coordinates representing different regions of the face, namely - mouth, left eyebrow, right eyebrow, right eye, left eye, nose and jaw. Of course, we don't need all the landmarks, here we need to concentrate on only the eye and the mouth region. We grabbed the indexes of the facial landmarks for the left and right eye and mouth respectively. After collecting all the data we started the video stream. We cannot directly apply algorithms on the video stream so we extracted each frame and applied our logic. For each frame we applied some pre-processing like resizing the frame and gray scaling.

It is often used for object detection in computer vision tasks. The DLIB has a 5-point facial landmark detector is 8-10. Other applications that need more points along the face, such as those that require facial landmarks, include

- Eyes
- Eyebrows
- Nose
- Mouth
- Jawline

It’s time to switch to the 68-point facial landmark detector. To diagnose sleepiness, the Eye Aspect Ratio (EAR) is used which diagnoses by comparing eye landmark width and height. This calculation is made possible due to the 68-point facial landmark detector which has six points per eye. As a result, we only have two points per eye when using the 5-point facial landmark detector. In order to calculate the eye aspect ratio, this information is insufficient.

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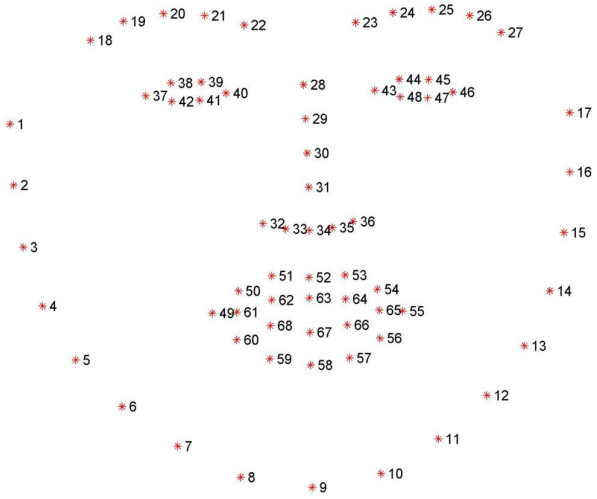
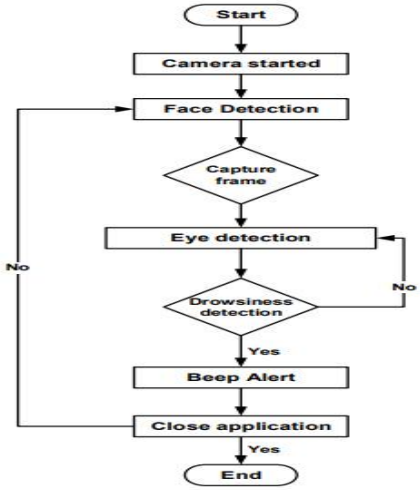


V. FLOW CHART



VI. SYSTEM IMPLEMENTATION

6.1 Modules Used

1. **NumPy:** NumPy is a Python package which stands for Numerical Python. As we know that NumPy is an advance module which we implement and we come across it in this project in many useful ways. Whenever we are trying to store the images in the form of arrays and the coordinates of right eye, left eye and mouth.
2. **CSV:** A CSV file (Comma Separated Values file) is a type of plain text file that uses specific structuring to arrange tabular data. Because it's a plain text file, it can contain only actual text data in other words, printable ASCII or Unicode characters. The structure of a CSV file is given long by its name. The point of this is to save the image as raw data, most likely in a database, which could then be opened again in PyCharm. op_webcam.csv is the file used to save images in our project.
3. **OpenCV:** Software library OpenCV (Open Source Computer Vision Library) enables computer vision and machine learning by using open source machine learning and computer vision tools. For commercial goods, A common basis for computer vision applications, OpenCV was developed to do just that. BSD licensing makes it simple for companies to use and change OpenCV's source code. A total of 2500 optimized algorithms are provided in the library, encompassing a full spectrum of traditional and state of the art computer vision and machine learning techniques. These algorithms may be used to identify and recognize faces, categorize human

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activities in films, monitor camera motions and tracking object movements; and extract 3D models from stereo cameras; Other uses include stitching photographs together to generate a high-resolution image of a complete scene, finding comparable images in an image database, removing red eyes from photos shot with flash, and many more.

4. **DLIB:** There are 68 points (landmarks) on the face that may be obtained using DLIB software. You may also get a simpler algorithm of 5 points using the latest DLIB. The HOG(Histogram of Oriented Gradients) feature descriptor of linear SVM (support vector machines) is commonly used to extract features from image data. It is often used for object detection in computer vision tasks.
5. **Imutils:** A series of comfort functions to make basic image processing functions such as translation, rotation, resizing, represent, and displaying Matplotlib images easier with OpenCV and both Python 2.7 and Python 3. We have used imutils for mainly rotation and resizing the image according to our requirements.
6. **SciPy:** SciPy is a scientific library that uses NumPy underneath. It provides more utility functions for design, stats and signal processing. We have used SciPy to calculate Euclidean distance between two coordinates.

VII. CONCLUSION

From the result of system testing we can conclude that the response time for the drowsiness detection is 0.14 sec which is below 1 sec and nearer to 0.1 sec and hence the system is very responsive. The FAR and FRR of our system are not more than 6% which is at par. If we consider different cases such as Car and Truck we have found the optimal distance up to which our system will detect drowsiness is 1 meter. We have not considered camera to be positioned at an angle as we will be setting camera right in front of driver like nowadays how the Ola and Uber drivers are using GPS. This is how we have made our system more responsive and accurate. The whole project is designed to decrease the rate of accidents and to contribute to the technology with the goal to prevent fatalities caused due to road accidents.

VIII. ACKNOWLEDGEMENT

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