

Drowsiness Detection System

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Abstract—Road traffic accidents are the main cause of death, with about 1 million deaths every year. Most of these accidents caused are by the driver's drowsiness. The construction of the highway reduces the driver's error range. Every night, countless people travel long distances on the highway. Lack of sleep or distraction can cause accidents. To prevent such accidents, we decided to build a system that can detect the driver's drowsiness and can also alert the driver. Facial landmark detection or recognition is used for image processing of facial images captured with a camera to detect drowsiness. To make this system work, we only need a web camera (or phone camera) and a laptop, thus making the system inexpensive.

Keywords—*Drowsy Driving , Drowsiness Recognition, Driver.*

I. INTRODUCTION

This technology helps reduce the number of accidents caused by drowsiness. Driver fatigue is also an important factor in many traffic accidents. In the most recent survey, about 50% of road traffic accidents are estimated using the latest statistics. Fatigue-related crashes can cause 1,200 deaths and 76,000 injuries each year. Thus, over the years it has now become a major challenge to avoid such accidents. Since drowsiness can be dangerous, some strategies need to be developed to counterbalance its effects.

And whatever technology being developed needs to be effective and inexpensive. The driver becomes distracted when an item or occurrence diverts the attention of an individual from the driving task.

Unlike the distraction of the driver, the drowsiness of the driver excludes cause incidents but is

characterized by gradually paying attention to the needs of the road and traffic.

The drowsiness of the driver, however, also has the same effect, which is to decrease driving efficiency, prolong reaction time and increase the risk of collision [1].

The incoming live feed is analyzed in real-time to determine the exhaustion level of the driver in the event of drowsiness, based on the data captured from the camera.

The output is then transmitted to the warning system and an alarm is released.

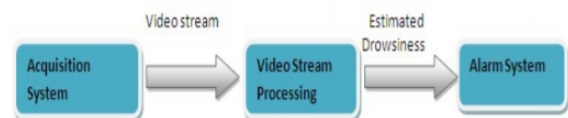


Fig.1.Block Diagram of overall System [2]

The driver is responsible for planning the route and timetable so that they can get enough rest and sleep. As with any job, the driver is also responsible for ensuring that he is fit for duty. This means avoiding the use of dangerous drugs, drugs and alcohol, and giving yourself enough time to sleep after get off work. Maintaining a secondary job that does not allow adequate sleep will make the driver responsible for his own job choices rather than rest. A common misconception is that by turning up the music, drinking coffee and increasing the temperature of the vehicle's air conditioning, the driver can stay alert when tired. Although taking these measures in the short term may feel relaxed, the only real solution to fatigue is sleep.

In reality, being emotionally exhausted will cause the body to tire more easily [3].

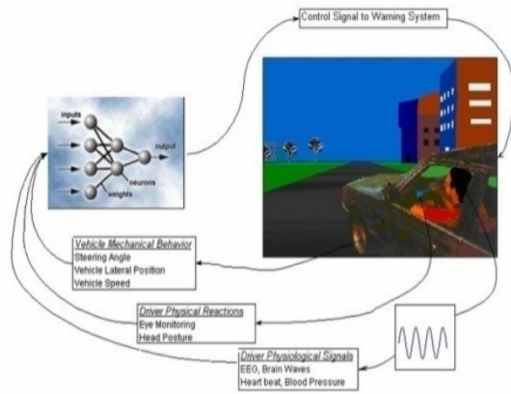


Fig.2. Different Approaches for Drowsiness Detection and Warnings [4]

II. REQUIRED TOOLS AND TECHNOLOGY

The requirement of tools is quite straightforward. We just need a laptop installed with the latest version of OpenCV, Python, and a webcam which we can use from laptop- **OpenCV, DLib, Python, Raspberry Pi, Webcam**.

Facial recognition should be first performed in order to detect eye blinking.

OpenCV[5] is a software library for open source computer vision and machine learning. It was initially developed by Intel and later funded by Willow Garage and then by Itseez. Under the open-source Apache 2 Licence, the library is cross-platform and free to download.

OpenCV makes it easier for companies to use and change the code. It was designed to provide computer vision systems with a shared infrastructure and to speed up the use of machine perception in consumer products.

In the library, there are thousands of algorithms that can be used to recognize and recognize faces, recognize objects, distinguish human behavior in photographs.

It can be also used to trace camera motions, trace moving objects, retrieve three-dimensional object models, create 3D point clouds from stereo cameras, link images together to construct a whole scene with a high-resolution image, locate related images from an image database, delete red eyes from images taken with a flash, face gestures are

followed, scenery recognized and markers created to overlay it with virtual reality, etc.

In businesses, academic organizations and public agencies, the openCV library is widely used. Along with well-established businesses that use the library, there are several startups that make heavy use of OpenCV, such as VideoSurf.

Dlib is essentially a cross-platform software library built in C++ programming language. Its architecture is highly inspired by the concepts of component-based software engineering.

It is thus, a collection of individual program components. This is an open-source project published under the Boost Software License.

Python[6] is a programming language that is general purpose, scalable, and efficient. Since it is simple and easy to read, it is a perfect first language.

Python will do anything you want to do. It can be used from web creation to computer learning to data science.

Many, because of the improved productivity it offers, Python has now become the most popular language.

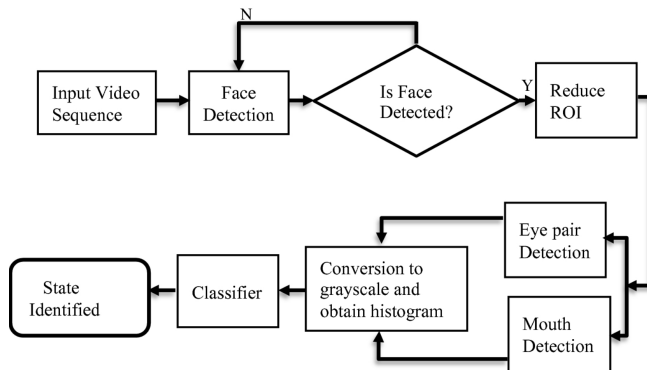


The execution of the program is extremely quick because there is no compilation phase.

It is easy to debug Python programs. If there is a flaw or bad feedback, it is never going to trigger a segmentation error. Instead, it produces an exception when the interpreter finds an error.

It is commonly anticipated that Python programs would run slower than Java programs, but they still require far less time to develop. Usually, Python programs are relatively shorter than Java related programs.

III. FACIAL LANDMARK IDENTIFICATION

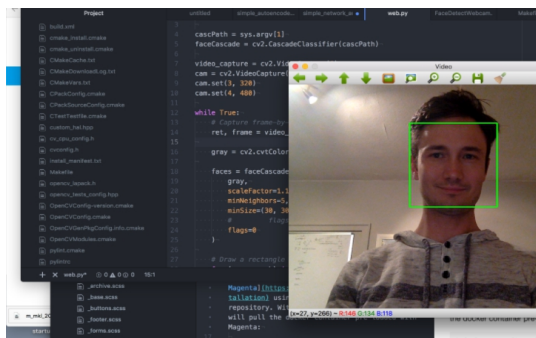


Therefore system which we are going to make uses a webcam to recognize facial expression through webcam, a portable webcam would be very good for this good so that we can stick it to the dash board of the car or we can use micro camera hidden in stuff toys and put it to the dash board facing it to the driver.

The system is going to be based on purely program coding in laptop, so it is necessary to have a laptop with latest version of openCV, python, raspberry pi. Not most needed but it is good to have a fast processing laptop so that it does not crash while running such a huge programme.

The concepts that are used in this system are-

- Detecting the key facial features, in this case we are only concerned about the eye region that we can call the region of interest.
- The second aspect is to measure how long the eye remains closed. Using this knowledge, we will assess the period an alert will be given afterward.



Facial landmark detection[8] is an operation to identify and monitor main facial landmarks. Our aim is to use type prediction methods to detect significant facial structures. Facial landmark identification is a two-step method

-First is locating the face on the video frame.

-After that extracting the key feature from ROI.

Face recognition can be done in a variety of ways. We may use the built-in Haar Cascade of OpenCV.

Linear Support Vector Machine object detector may be used directly for linear face recognition tasks.

The algorithm used to identify objects in the image doesn't even apply in any of the above situations. Instead, it is necessary that we attain the bounding box of the face by some method.

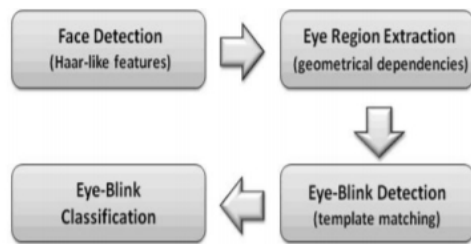
The detection mechanism that resides in the dlib library is the implementation of the *"an Ensemble of Regression Trees"*. [9]

The facial landmark detection system used within dlib generates several x and y coordinates, that link to unique facial features. They are actually obtained by the shape predictor exist within dlib.

In order to map facial expressions from an image or film, a facial recognition device uses biometrics. To find a mate, it contrasts the details with a collection of recognized names.

Facial landmark recognition operates in this way. The technology extracts key attributes from certain frames once you see an image.

The information then can be processed and accessed. Half of all people, for example, have their photographs registered in one or more databases that authorities can check for.



IV. THE ARCHITECTURE

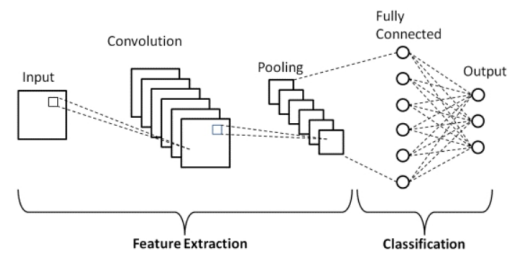
Convolutional Neural Networks [10] is the model used to build this framework.

It is a particular kind of artificial neural network that performs exceptionally well for the purposes of feature extraction.

CNN comprises different layers:

- The first layer is convolutional layer, the feature of this layer is to extract different attributes from the input images. The output of this layer is feature map which can further be given to other layers for further processing.
- The next layer is pooling layer, this layer basically decreases the size of the received feature map. It typically acts as a barrier between the Convolutionary Layer and the Fully connected layer.
- After Pooling we have a Fully connected layer, what it basically does is perform various mathematical operations on the received flattened vector.
- The next one is dropout, it is used to compress the model's size, to solve the problem of performance deficiency for new data.
- The last one is activation functions, they are used to estimate some kind of relationship between the variables in the connection.

The figure shown below shows the layer of CNN architecture:



V. MERIT OF PROPOSED SYSTEM

The key goal of our project is to create a device that will detect the driver's exhaustion and then, with the aid of an alert, issue a warning. This system can help to avoid collisions or injuries.

Since injuries are typically caused by driver distraction or somnolence. The margin of error for the driver was reduced by the development of an expressway.

Both day and night, countless people travel long distances on the expressway. The lack of sleep or diversion can lead to an accident.

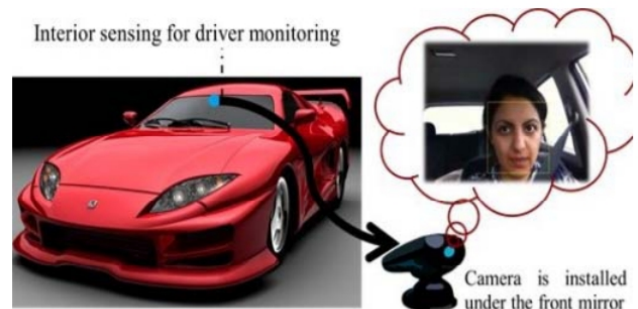


Fig.8. APEXTM Camera Setup (b)

VI. CONCLUSION

There are a variety of techniques used to diagnose drowsiness.

After a study of various types of techniques, the best approach we might recommend is to use a camera, since it can be conveniently implemented under any circumstances.

We used this computer vision approach and suggested a better method for detecting drowsiness of the driver based on the detection of eyelid closure and opening using convolutional neural networks.

The camera used in this system, has to be placed in a way that the driver's vision of the road can not be obstructed.

Linked Mapping is used to detect the largest area. The driver's face can be identified in the video in a quite way that it does not impair the efficiency of correct facial recognition in lightning conditions.

VII. REFERENCES

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