

Comatose Detection System Using OpenCV

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Abstract - The project proposes a software application which will alert the driver if he/she feels sleepy while driving the vehicle. NumPy, OpenCV, DLib, Imutils libraries are imported using Anaconda Prompt. The in-built function `frontal_face_detection` of DLib library is used instead of the `haarcascade_frontal_face_detection_default.xml` file to get better results. This project is very useful for people like truck driver's etc who travel late night and for long distances.

Index Terms - Prompt, IDE, Facial Landmarks, Aspect Ratio.

INTRODUCTION

Drowsiness is an intricate phenomenon which states a decrease in the alertness of a person especially for a driver. No direct measures are there to detect the level of drowsiness in a person but indirect measures can be used in place of that. As per a recent survey, it has been found that 21% of the accidents occur in India due to drowsiness while driving. As per a report by a national newspaper, every year about 150 thousand people die due to road mishaps in India, most of these due to drowsy driving. Therefore, it is necessary and important to build hardware or software models which can reduce such accidents and save the lives of people. The OpenCV and DLib libraries helps in creating a region of interest on the driver's face which helps in determining the state of the driver like: active, drowsy or sleepy using the facial landmarks.

HARDWARE AND SOFTWARE REQUIREMENTS

Python: It is a general-purpose, object-oriented, interpreted high-level programming language. Known for it's less complicated syntax, it is commonly used

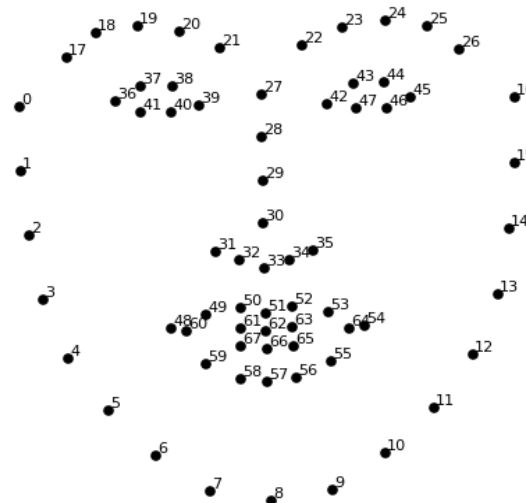
in Data Science, Machine Learning, Deep Learning projects. The version used in this project is 3.8.10.

pip: It is a package management system which is used for installing and managing various libraries. It is written in Python language. The version of pip used here is 21.1.3.

OpenCV: A cross-platform library having programming functions used in real-time computer vision. Developed by Intel, it is free for use in the open-source BSD license. Its principle work here is to detect the face of the driver and create a region of interest. The version used here is 4.5.2.54.

DLib: To detect the facial landmarks on the driver's face

DLib is used. The version used in this project is 19.22.0.



Imutils: The library Imutils is imported to use its in-built function `frontal_face_detector` to create the facial

landmarks on the driver's face. It makes the processing of OpenCV easier. The version used is 0.5.4.

NumPy: NumPy or Numerical Python. This library is used in the processing of 1D and multidimensional arrays. It has got various in-built functions for linear algebra. It is also used in the calculation of Fourier Transform. NumPy is better than list because it is faster, convenient and occupies less memory. The version used is 1.21.0

Programming Tool: The IDE or Integrated Development Environment used is Jupyter Notebook, part of Anaconda. It is an open-source web application that is very commonly used for python programming. The version used is 6.4.0.

WORKING

The project includes direct working with 68 facial landmark detector and also the face detector of the Dlib library. The 68 facial landmark detector is a robustly trained efficient detector which detects the points on the human face using which we determine whether eyes are open or closed. We are using Dlib, so to get better accuracy and in the result, we can find 68 landmarks points. We are working on three stages on both driver's with and without specs:

- 1)Active
- 2)Drowsy
- 3)Sleepy



We are importing five libraries: Numpy, Dlib, imutils and open-cv. After that we are using 'cap' which is used basically for the purpose of taking instance of webcam. We are using an in-built function of Dlib library which is frontal face detector. It gives more accurate result as compared to haarcascade files. Dlib shape predictor is used as gives the 68 landmarks on the driver's face. 6 on each eye, 9 on nose, 5 on each eyebrow, 20 on lips and 17 on the circumference of the face. Next is the function Compute which is used to measure the difference between two points A and B. Next is the blink function. As we have seen from the 68 facial landmarks that each eye has 6 landmarks in which two at the corners of the eyebrows are the long points and the other are short points. (36,39: long points) (37,98: short points). A formula is used where both the long distances are added and then divided by twice the short distance. This ratio is called the Eye Aspect Ratio. Some conditions are assigned for the eye aspect ratio.

1)If the eye aspect ratio is greater than 0.25, then 2 is returned.

2)If the eye aspect ratio is greater than 0.21 and less than 0.25, then 1 is returned.

3)If the eye aspect ratio is less than 0.21 then 0 is returned.

This 0,1,2 determines the blinking of the eyes. Zero will be assigned to the variables left_blink and right_blink. If the left_blink or the right_blink is zero then the system will detect the driver to be Sleeping. If the left_blink or the right_blink is 1 then the system detects the driver to be in Drowsy state. If none of the conditions are satisfied, then the system detects the driver to be in Active state.

APPLICATIONS

- Can be used in the detection of drink and drive.
- The same setup can be used in aircrafts also.
- Can be used from protecting the driver and other people in case of theft or any other causalty.

RESULT

The code was implemented and the following results were obtained:

- 1)The 68 facial landmarks were created on the face.
- 2)The software tested the state of the driver that whether the driver was active, drowsy or sleepy.

CONCLUSION

The drowsiness detector successfully analyzed the 68 facial landmarks on the driver's face and calculated the eye aspect ratio. It also determined the blinking of the left eye and right eye which further determined the state of the driver. As road accidents are frequent in India due to drowsiness, this reliable system can prevent such accidents and can save the lives of people at low cost.

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