

Driver Dizziness Detection Using Python

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Abstract: Accident is an incident that happens unexpectedly, for some mistake done, but if the mistake is from our side, we can prevent it. Since the majority of accidents are caused because of distraction or the drowsiness of the driver, people taking a long drive often suffer from lack of sleep and are prone to an accident. To prevent such accidents we propose a system which alerts the driver whenever he feels drowsy.

We will build a system which takes the facial features as input from a live recording through a webcam, or camera and then process each frame from the video, to detect the location of eye and by using mathematical calculations, analysing whether the eye location points are changing i.e. The eyelids are closing continuously or not, using the modules of Python i.e., Tkinter, Scipy, imutils, dlib, CV2, PyGame and alert the driver with an audio alert, which makes him stay awake.

Keywords - Python, webcam, camera, Euclidean algorithm, facial recognition

I. INTRODUCTION

Road traffic accidents, the leading cause of death by injury and the 10th leading cause of all deaths globally. We make up a significant portion of the worldwide burden of ill-health. An estimated 1.2 million people are dead in road accidents each year and 50 million are injured, occupying 30 to 70 percent of orthopedic hospital beds in growing countries. If current trends continue, road traffic crashes are expected to be the third largest contributor to the global burden of disease and death by 2020.

Developing countries bear a large share of the burden, accounting for 85 percent of annual deaths and 90 percent of disability-adjusted life years (DALYs) lost due to road crashes. Road crashes affect mainly men (73% of deaths) and people aged 15-44 years, creating enormous economic hardship due to the loss of the breadwinner.

Road traffic injuries are predictable and preventable, but good data are important to understand which road safety interventions and technology can be successfully transferred from developed countries where they have effectively proven. Awareness of the consequences of road traffic accidents is low among politicians and the public. What we need is to integrate comprehensive road safety programs into national planning in developing countries.

Exhausted drivers who doze off at the wheel are responsible for about 40% of road accidents, says a study by the Central Road Research Institute (CRRRI). The find rings the alarm bell for how Indian highway drivers ignore the importance of adequate rest and endanger lives in the end.

II. DESIGN AND IMPLEMENTATION

Accident is an incident which happens unexpectedly, for some mistake done, but if the mistake is from our side, we can prevent it. Since the majority of accidents are caused because of distraction or the drowsiness of the driver, people taking a long drive often suffer from lack of sleep and are prone to an accident. To prevent such accidents we propose a system which alerts the driver whenever he feels drowsy. We will build a system which takes the facial features as input from a live recording through a webcam, or camera and then process each frame from the video, to detect the location of eye and by using mathematical calculations, analysing whether the eye location points are changing i.e. The eyelids are closing continuously or not, using the modules of Python i.e., Tkinter, Scipy, imutils, dlib, CV2, PyGame and alert the driver with an audio alert, which makes him stay awake.

SVM (Support Vector Machine) is used to classify the components in the input video. During cropping, the region of the components of interest in the video is not accurate. Sometimes it will show regions wrong. To feel the eyes, we must first create delimitation boxes for this and a classification algorithm. The SVM algorithm will not be supported. The disadvantage is that the region of interest cannot be clearly identified.

There are many algorithms and methods for tracking of eye and monitoring it. The initial objective of this

project is to use retinal reflection as a means of finding eyes on the face, and then to use the absence of this reflection as a means of detecting when the eyes are closed. The application of this algorithm to successive video images can be useful to calculate the time of eye closure. The eye closure time for drowsy drivers is longer than the normal blink. The advantages are that the region of interest is clear to identify and the creation and tracking of the bounding box is clear.

III. SYSTEM REQUIREMENTS AND DESIGN

A. Facial Recognition

In Machine Learning techniques, Face Recognition using Python is the latest trend. The most popular library for computer vision called the OpenCV provides bindings for Python. It uses machine learning algorithms to fetch faces within a picture or photograph. It is exciting to know the various ways of face detection using Python.

Deep Learning algorithms are used to compare a live capture or digital image to the stored face print in the database or stored memory in order to verify an individual's identity. There are three stages of face recognition in any language. They are,

1. Training Data Gathering: Gather face data (face images in this case) of the persons you want to recognize.
2. Training of Recognizer: Feed that face data (and respective names of each face) to the face recognizer so that it can learn.
3. Recognition: Feed new faces of the persons and see if the face recognizer that is just trained recognizes them.

OpenCV provides the following three face recognizers:

1. Eigenface recognizer
2. Fisher face recognizer
3. LBPH face recognizer

B. Tkinter

Tkinter is a graphical user interface (GUI) module used in Python, to make desktop apps. Windows, buttons, show text, and images amongst other things can also be made.

C. Pygame

Pygame is a cross-platform set of Python modules that is designed for writing/ creating video games. Computer graphics and sound libraries are included for designing and using the Python programming language.

D. SciPy

SciPy is a free and open-source Python library. It is used for scientific computing and technical computing. It includes modules for optimization, linear algebra, integration, interpolation, special functions, FFT, signal and image processing, ODE solvers and other common tasks in science and engineering. It includes tools such as Matplotlib, pandas and SymPy, as well as a growing set of scientific computing libraries. This NumPy stack has similar users to other applications such as MATLAB, GNU Octave and Scilab. It is also called the "SciPy stack".

E. Dlib

Dlib is a general-purpose cross-platform software library written in the C++ programming language. The design is heavily influenced by ideas from a design by contract and component-based software engineering. It is a set of independent software components. It is released under a Boost Software License. DLib-ml implements numerous machine learning algorithms:

SVMs,
K-Means clustering,
Bayesian Networks, and many others.

DLib also features utility functionality including
Threading,
Networking,
Numerical Algorithms,
Image Processing,
and Data Compression and Integrity algorithms.

F. Imutils

The translation is the shifting of an image in either the x or y -direction. To translate an image in OpenCV you need to supply the (x, y) -shift, denoted as (t_x, t_y) to construct the translation matrix M :

$$M = \begin{bmatrix} 0 & 1 & t_x \\ 1 & 0 & t_y \end{bmatrix}$$

In the next step, the `cv2.warpAffine` function is used. Instead of manual construction, the translation matrix, and of calling `cv2.warpAffine`, it is easy to make a call to translate the function of `imutils`.

Resizing an image in OpenCV is attained by calling the `cv2.resize` function. Special care needs to be taken to make sure that the aspect ratio is maintained. This function of `imutils` maintains the aspect ratio and gives the keyword arguments `width` and `height`. This way the image can be resized to the desired width or height while (1) maintaining aspect ratio and (2) making sure the dimensions of the image do not have to be explicitly computed by the developer.

Skeletonization is the process of building the "topological skeleton" of an object in an image, where the object is presumed to be white on a black background. OpenCV does not provide a function to explicitly build the skeleton but gives the morphological and binary functions to do so.

G. OpenCV

OpenCV (Open Source Computer Vision Library) is an open-source computer vision and machine learning software library. It was built to provide a common infrastructure for applications on computer vision and to exponentially increase the use of machine perception in commercial products. As OpenCV is a BSD-licensed product, it is easy for businesses to utilize and modify the code.

IV. EUCLIDEAN ALGORITHM

Suppose a and b are non-zero integers. The **greatest common divisor** (gcd) of p and q , denoted as (p,q) or $\text{gcd}(p,q)$, is the largest positive integer that divides both p and q . We will deal almost exclusively with the case that a and b are not negative, but the theory goes through essentially without change if a or

b is negative. The notation (p,q) could be a bit confusing because it is also used to denote ordered pairs and open intervals. The meaning is usually clear from the context.

Let u_0 and u_1 be positive integers.

$$u_0 = q_0 u_1 + u_2$$

$$u_1 = q_1 u_2 + u_3$$

:

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$$u_{n-1} = q_{n-1} u_n + u_{n+1},$$

where $0 = u_{n+1} < u_n < \dots < u_2 < u_1$. Then $u_1 = \gcd(u_0, u_1)$.

We define $E(u_0, u_1)$ to be the number of division steps performed by the algorithm on input (u_0, u_1) and we see that $E(u_0, u_1) = n$. It can be proved by induction that if $u > v > 0$, $E(u, v) = n$, and u is as small as possible, then $(u, v) = (F_{n+2}, F_{n+1})$, where F_k denotes the k th Fibonacci number, defined by $F_0 = 0$; $F_1 = 1$; and $F_{k+2} = F_{k+1} + F_k$ for $k \geq 0$.

The recognition of Iris is an automated method that uses biometric identification by implying mathematical pattern-recognition techniques on video games of one iris or both irises. Their complex shapes are unique, stable, and visible from a distance.

V. RESULTS

As a result, facial recognition and retinal analysis help in detecting, and the alarm are initiated that alerts drivers from sleep.

This reduces the possibility of accidents due to drowsiness.

Thus, this drowsiness detection system uses python and its modules to indicate the driver to stay alert.

VI. FUTURE WORKS

In the future, Raspberry Pi 3, infrared camera, speaker, microphone, and many sensors can be used in combination to reduce accidents caused by drivers' dizziness. Also in the future, we can build a system that is linked with an application on a smartphone and check the real-time reaction rate. Also since many car manufacturers are now using driverless cars which reduces accidents by exponential rate. It will take time for driverless cars to be implemented in India due to the kind of roads and traffic we have compared to any other country.

VII. CONCLUSION

Every new invention or breakthrough will have both pros and cons, but we as human beings must take care of it and use the pros of the invention to create a better world. Of course, AI has massive potential advantages. The key for humans will ensure that the "rise of robots" does not get out of control. Some say that artificial intelligence can destroy the human race if it falls into the wrong hands. But there is still no AI application of this magnitude that can destroy or enslave humanity.

VIII. REFERENCES

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