**EYE Gaze Detection**

In this project we build an application that is capable for recognizing the eye movements and detect when the person will blink the eye. Eye movement detection refers the gaze detection, where looking LEFT, RIGHT AND CENTER. Open cv library used for live webcam, that takes your live picture predicts and detects the face using face landmark using dlib.shape\_predictor(). The two main functions are used for Gaze detection and recognizing eye blinking. See in Fig 1 about the eye Gaze detection.

Diagram

Description automatically generated

Fig 1

If you see in the Fig 2 the structure of eyes there is sclera (white part), iris is the biggest circle, and the pupil is small circle in the iris.

A close up of a person's eye

Description automatically generated with medium confidence

Fig 2

We the converted the image into grayscale and find the threshold exactly by the pupil. Using the threshold, find the biggest contours and remove the noise. After that we find the region of interest of both left and right eye. Then we detect the gaze, we need to understand how eyes appears when looking in different direction. If we look at right, the sclera (white part) will be on left side. If we look at left the sclera will be at on right side, but if we look to the center the white will balance between left and right.

**EYE Gaze Ratio ()**

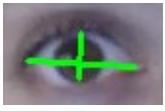
A picture containing diagram

Description automatically generated

We will focus on the white part for calculating the gaze ratio. We split our eye like that as shown in figure. If we look at left side, sclera will be more visible on right part. We calculate the threshold of both eyes, then find the white pixels of both eyes respectively, divide the pixel of left eye to the right eye we will get the gaze ratio. We pass the eye points and face landmarks of both eyes as a parameter in the gaze detection which returns the gaze ratio. Took the average for both left and right eye. If the gaze ratio is smaller than 1 that means person is looking at right, if ratio is greater than 1.7 person is looking at left and if the ratio between 1 and 1.7 means looking at the center.

**EYE BLINKING Ratio ()**

Let’s thing that there are how many ways, we can find the eye is blinking. There is total three ways. For instance, if eyelid is closed, we cannot see eyeball anymore and bottom and upper eye lashes comes closer. Human can blink eye just happen for short amount of time, approximately 0.3 to 0.4 seconds. We created the two lines on an eye horizontal and vertical line. The horizontal line will remain constant not matters eye is closed or open, but the vertical line fluctuates. The vertical line is maximum when eye is open and gets shorter when the upper and bottom eye lashes come closer. See in the FIG:



So, we calculate the ratio between horizontal line and vertical line. If the ratio gets below to the specific number that means eye to be closed, otherwise is open. We insert the eye points and face landmarks to get the ratio between the lines. Take the average of both left and right eye. Through experiment we came that most reliable threshold is 5.7, if the blinking ratio is greater than this threshold that means eyes are blinking, otherwise not.

**Related Search**

Eye Gaze tracking is one of the most challenging problems in computer vision. A method of detecting eye movement is called oculography. There are four different methods, but in this research, we used video oculography system use camera to input the image data. The first step to detect the main region of interest (ROI) eye. Based on that information eye region and possibly head pose, the direction of gaze can be estimated. The most important part of human eye are the pupil – the aperture lets the light into the eye, the iris – colored muscle group control the diameter of the pupil (biggest circle) and the scelera – the protective tissue (white part) of the eye. [2]

REFERNCE

[1] [www.pysourcetech.com](http://www.pysourcetech.com)

[2] A SURVEY ON EYE-GAZE TRACKING TECHNIQUES H.R. Chennamma Department of MCA, Sri Jayachamarajendra College of Engineering, Mysore, Karnataka, INDIA [anuamruthesh@gmail.com](mailto:anuamruthesh@gmail.com)