A SOLUTION TO IMPROVING QUALITY OF LIFE AND EDUCATION FOR PHYSICALLY CHALLENGED PEOPLE.

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ABSTRACT

An artificial intelligence based that uses digital images and visual inputs is given in the paper. This interface detects the movements of the eye balls and moves the cursor. This includes a webcam to recognise the face. For identifying the eyes, the support vector machine have been used. The eye balls can be moved in the different directions as the operator moves. The moving of face in upwards and downwards direction helps to move the cursor upward and downward. The system is on the camera and requirements of some lights for operating. This technique is used for people who are physically disabled and are dependent on others to survive. The wheel chair is designed to operate through PC system and is then interfaced with the PC. Through movement of eyes and blinking of eyes we can operate the wheel chair in any particular direction needed.

INTRODUCTION

Eye blinks detection technology is essential and has been applied in different fields such as the intercommunication between disabled people and computers. The proposed system includes face detection, face tracking, eye-blinking, and interpretation of sequence of blinks. To exchange the mouse with the human face and eye movements to communicate with the operating system of computer. The wheel chair is operated by using the buttons displayed on the screen of the laptop by using the eye blink technology. The buttons displayed on the laptop will be the commands to the wheel chair to move in the required directions.

MATERIALS AND METHOD

Webcam:

A webcam acts as a camera used in to display the operator's image on the desktop. This is a hardware device that inputs images of the operator and supplies it to the frame grabber. A web camera has no in-built memory chip. Hence, it transmits them immediately to the system desktop.

Desktop:

The processing takes place on the desktop. It only must display the image received from the web cam and provide display to the user.

Mouse pointer:

The mouse cursor or mouse arrow, or mouse pointer is often shaped like an arrow or a small hand with the index finger pointing towards the top of the display device. The mouse pointer moves as the user moves his or her head and blinking odd eyes trigger the clicking.

Eye blinks detection technology is essential and has been used in different fields of the todays world for intercommunication between disabled people and computers.

Battery:

Battery is a storage device used to store the electric charge and use them for operating the electric devices. There are different types of batteries depending on their voltage ratings and also available in different sizes.

Motors:

The Motors used to run the wheel chair is a DC motor which runs on a battery. The DC motor have two major components stator and armature, the stator is the stationary part and armature is a rotatory part. DC motors offer highly controllable speed. By changing the armature or field voltage it's possible to achieve wide speed variation and with this level of controllability, DC motors offer the precision required by a huge range of industry applications.

Node MCU:

The Node MCU is the equipment in which programming for any hardware operating device is programmed in. It has a better processor and memory when compared with Arduino. Node Micro Controller Unit is a microcontroller development board with Wi-Fi capability. It uses an ESP8266 microcontroller chip.

EYE ASPECT RATIO

Eye Aspect Ratio (EAR) is a scalar value that responds, especially for opening and closing eyes. To distinguish between the open and closed states of the eye, we used an EAR threshold. During the flashing process, we can observe that the EAR value increases or decreases rapidly. According to the results of studies, we used threshold values to identify the rapid increase or decrease in EAR values caused by blinking. There are many number of ways for eye blink technology that have been discussed. As there are some limitations on this technology, such as strict restrictions on image and text quality, which are difficult to overcome. By referring to previous research result, we selected EAR threshold of 0.2 and 0.3 in our experiment. EAR formula does not depend on the colour and size of the face, thus providing the benefit of identifying faces from a distance.

To distinguish between the open and closed condition of the eye, they used an EAR threshold of 0.3. Figure 2 depicts the progression of time it takes to calculate a typical EAR value for one blink

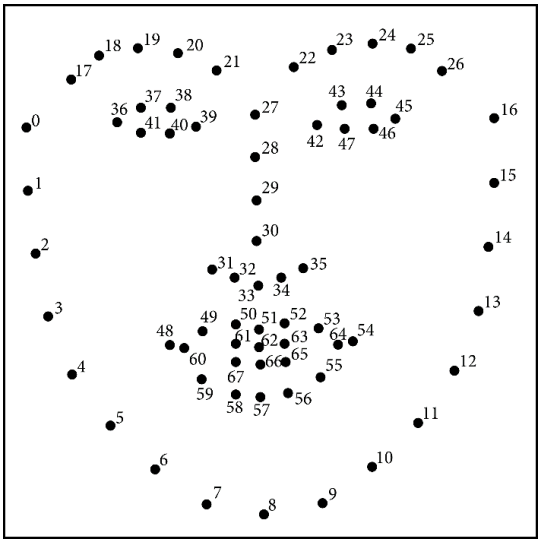


Fig. 1

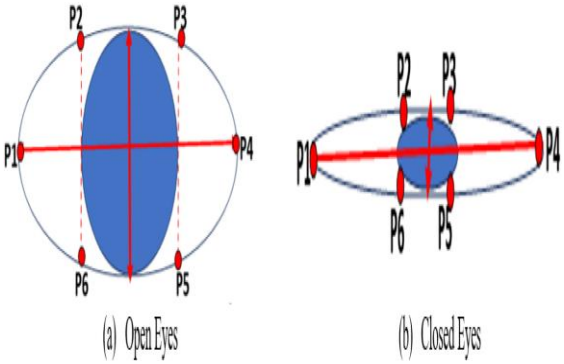


Fig. 2

The examples of open eyes and closed eyes with facial landmarks (P1-P6).

$$EAR = \frac{[P2-P6]+[P3-P5]}{2[P1-P4]} \text{(Eqn-1)}$$

1st equation describes the EAR equations, where P1 to P6 represent the 2D landmark positions on the retina. As illustrated in figure (a).above P2, P3, P5, and P6 were used to measure eye height, while P1 and P4 were used to measure eye width. When the eyes are opened, the EAR of the eyes remains constant, but when the eyes are closed, the EAR value rapidly decreases to almost zero, as in figure (b).

Modified Eye Aspect Ratio (Modified EAR)

Based on the thing that human eye sizes are different, in this proposed thing, we recalculate the Eye Aspect Ratio of the threshold. In this paper, we have the modified aspect ratio of the eye (Modified EAR) for closed eyes with Eq. (2) and open eyes with Eq.(3)

EAR Closed =

$$\frac{[P2-P6]\,min + [P3-P5]\,min}{2[P1-P4]max} \text{.....(eqn.2)}$$

EAR Open =

$$\frac{[P2-P6]\max + [P3-P5]\max}{2[P1-P4]\,\min} \text{.....(eqn.3)}$$

From eqn.(2) and eqn.(3) we calculate our Modified EAR in eqn.(4)

Modified EAR Threshold =

(EAR Open +EAR Closed)/2 .....(eqn.4)

Eye Status =

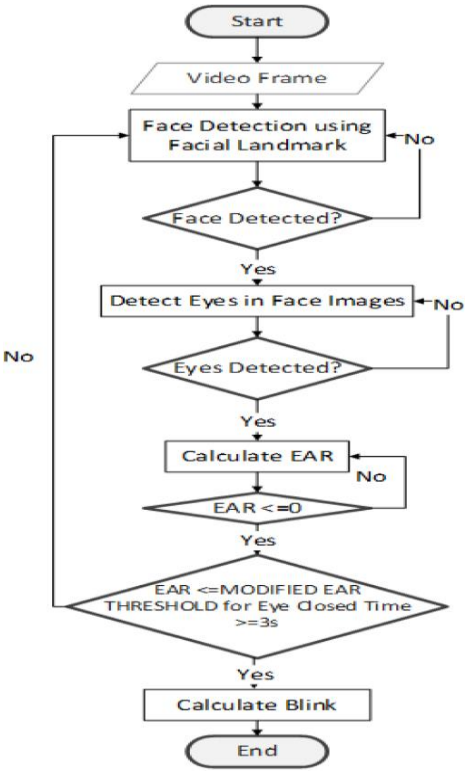
{EAR ≤ EAR Threshold = Eye Closed

EAR ≥ EAR Threshold = Eye Open}

(eqn.5)

Eqn.(5) depicts the EAR output range while the eyes are open and closed. When the eyes are closed, the EAR value will be close to 0, but the EAR value may be any integer larger than 0 when the eyes are open.

EYE BLINK DETECTION FLOWCHART



EXECUTION PROCESS:

The different execution process includes different steps like installing and downloading the required software's, running the model, reading the input, output.

Running the model:

Now open the code written in the IDE and click on the run command and then the controller takes time and then after some time we see the window where camera gets opened and traces the movements of your face.

Reading the input:

As soon as you click on the run python file in terminal the system gets loaded and the output window will be opened and it starts to read eyeballs and the head movement of the user

PROPOSED METHODOLOGY:

In this project, a hardware and software modules will be developed to give a solution to physically challenged people to gain education and quality of life. A program can be framed using programming language in computer. Eye blinking and eyeball movements will be sensed by using camera and interfacing with software program. A Bluetooth controlled automatic wheel chair is planning implement, which is used to help them to move around without being dependent on others. A laptop, a web camera, sensors, wheel chair, batteries and motors are the main equipment's of the project. Initially we write the code into the compiler. When we run this code the eye blinking and eye ball movements are detected with the use of web camera which help us to move the cursor perform the clicking operation of the mouse. This system is also connected to the wheel chair that helps in its movement. The wheel chair is designed in such a way that it takes the command from the user and transmits the signal to the operating device which in turn sends the signals to the motor to move the wheels of the chair in the required direction. The laptop and the wheel chair can be controlled by the person who is operating it without any other person's help. It is a simple and a cost effective project that will help the physically disabled people to overcome their difficulty in doing the tasks.

Fig.(a)

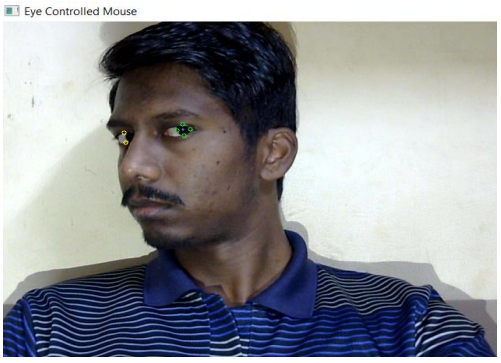


Fig.(b)

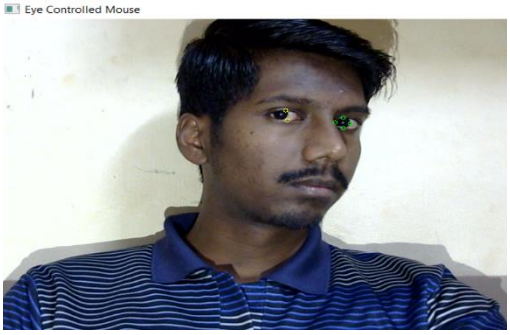


Fig.(c)

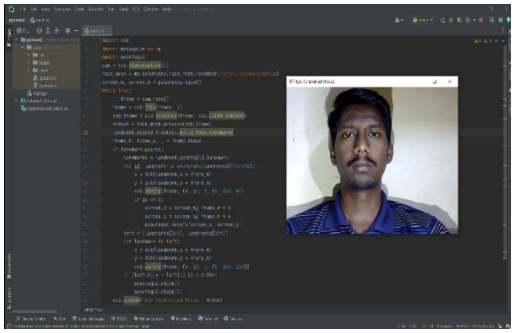


Fig.(d)

The figures (a), (b), (c), (d) show how the output window would look like when the code is run. In these figures we see how the movements of face and eyes are continuously traced by the controller.

CONCLUSION

We have implemented a system to access the mouse cursor on the computer screen using only the facial features. With the usage of a camera and pycharm technology, the system architecture is prepared. User is able to view head and movement of eye captured through the camera which is displayed on the screen; accordingly, the operator can move the mouse cursor as needed thus allowing any user to operate the system without prior registration. The wheel chair is controlled through the blinking of eyes by the buttons displayed on the system. This system is especially useful for the people without limbs.

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