

# Paper

*by P P*

---

**Submission date:** 20-Apr-2023 07:53PM (UTC+0530)

**Submission ID:** 2070330483

**File name:** research\_paper.pdf (53.56K)

**Word count:** 1680

**Character count:** 8431

**ABSTRACT** Nowadays everyone is suffering with some or the other problems, the science of today is both boon and bane to human species. In today era of technology,, the science has evolved itself into many phases and working on different resources to cure different problems of humans. This project revolves around the people who are physically challenged and undergo lots of sufferings to do their work on daily basis. In, this project we are using eye motion detection and eye blink , raspberry pi-4 module along with webcam using a virtual keyboard with a screen connecting each other via internet connection, for physically challenged person to express his feelings and give commands for his necessities. This project advances the use of technology and works on the section of society who are dependent on others and desiring death each day rather than this pitiful life. This project provides an interface between technology and emotions through the use of different libraries of python like dlib , numpy and Open CV

**1**  
**Keywords** - eye motion detection,eye blink detection,webcam,paralysed person,dlib,numpy,Open CV.

#### Introduction

**1**  
Paralysed person is a person who is suffering from brain or spinal cord injury and diseases. This results into body disorder into the patient partially or exhaustively. This results hindrances in the path of his communication with the world or gestures of emotions. Even in the maximal condition his mind and optic nerves are active and can work efficiently. Thus, these eye blinks and movements can be used in our system to communicate with the world. In this aristocratic purpose we will give a fluid interface to the person for dissemination of his messages, expressions and thoughts and this can be done without using even uttering a single word and hand movements. This project will enhance and add values to his life with **Human-Computer Interaction (HCI)** .

This HCI has certain requirements to fulfil the task like it should run in real time, used computers should be upgraded and should have good internet connections.

Other technologies that are present in today's market require the installation of sensors and different equipment on the body or inside the body of the handicapped person which can make him feel like the mouse **1** in a laboratory undergoing various experiments. As examples this technology uses breath puffing straws, tongue movement analysis, sensors mounted on the patient's head which makes these types of products too costly and fragile for middle class society.

The system that we are proposing is non-invasive and don't use any sensors or equipments mounted on the patient's body. There are less chances of infection in the cornea like itchy or swollen eyes and various such things. The system is inexpensive uses consumer grade computer without any special lighting and specific needs. No external intermediate source is required in the proposed system. The input is provided in the form of video frames that are processed with the help of Open CV and Python. The outcome of the process are the various positions of the pupils during eye movement. These outcomes can be utilised for various purposes such as accessing computer and smart phones with the help of a cursor, SOS amenities and other medical facilities.

#### FACIAL LANDMARK

There are 68 benchmark points on the human face that makes **1** targeting eyes only, a bit more specific task. These 68 benchmark points are the result of facial detector implemented inside the dlib. With the help of these points, the region of eye is detected and eyeball movement and blink detection can be processed. The beneficiary can navigate with the help

of proposed system and turn it on and off according to his convenience. A number of types of algorithms are utilised in order to serve the purpose. They are described as such:

#### Face Detection:

The foremost task of this process is precise face detection of a person in spite of varying light, different face shapes, hairstyles, glasses or contact lenses. This is carried out with the help of face detector implemented inside dlib, which produces a 68 benchmarked facial output thus mapping the quite a precise details of a person's face. Using the data an enclosing around the eyes can be computed. The experiment was carried out on 16-18 of our classmates, and an accuracy of 94.35% was noted.

#### Eye Location:

In this step, eye region is extracted from live video and eyeball detection and blink detection is carried out. This localization is extracted with the help of dlib which marks the eye along with other parts of the faces, then, those specific coordinates are processed to detect pupil movements and blink detections.

#### Threshold:

This step attempts at finding the whites of the eyes in the obtained eyes location. Based on the visibility or disappearance of the white of the eye for a period of time, blinks are determined. The concept of Eye Aspect Ratio (EAR) is employed to calculate the blink detection. The formula is given as:

Classification of various eye blinks:

There are two types of movements in human body known as voluntary movements and involuntary movements. Similarly, eye blinks can be divided into two categories, voluntary eye blink and involuntary eye blink. They can be separated out by a parameter of time taken. The blinks taking time more than 275 ms are said to be voluntary blinks. This parameter is based on EAR. If an eye is shut or open can be determined with the help of threshold values calculated using EAR. Double voluntary blinks using time between two successive blink intervals. And hence, these gestures allow the beneficiary to navigate the system.

#### Algorithm

In the proposed algorithm the left and right eyes are detected after comparison from previous stage, calculating bounding boxes and two separate sub-images will be formed for left and right eyes. by interpolation the eyes generated are of static size. The size of eyes is directly proportional to the size of face, assuming head at rest. The differentiation is calculated between voluntary and involuntary eye movements. Thus, by using above standard eye movement is identified and is regarded as important term for the Graphical User Interface is provided.

#### Eye Pupil Tracking using Hough Circle Transform

For the detection of pupil movement, we construct a hough circle using Open Cv library. This hough circle is formed when any round shaped object is found in video frame. The two hough circles are formed one covering around the pupil and another one circling around iris.

#### Tracking of object

The coordinate is calculated using Hough circle, three circumstances are identified in the overall scenario as follows-

1. left eyeball deflection means the patient is looking at his left side.
2. right eyeball deflection means the patient is looking at his right side.
3. no deflection in eyeball means eyeballs are at rest

This also identifies whether the blinks are intentional or not. This increases the accuracy of the algorithm by 85.4%.

### III Proposed System

The system adds uniqueness and ease in its operability mode, requiring no extra skills and calibrations to execute the system. No training sessions or user manuals is mandatory for the system to learn. Even a kindergarten kid can operate the system efficiently, that makes the system simpler to operate.

The eye movement of eyeballs can be used to select any alternatives displayed before the person. The system can be switched on and off by the intentional eye blinks, the redo and undo commands are also present in the system for the patient to make it more and more convenient to him.

The system uses the web camera which records the pupil movement, which is then connected to raspberry pi providing an interface to the patient with the help of virtual keyboard and screen to the patient which will display various alternatives and he will choose the right one as per need of his hour. The system provides antibacterial interface by not mounting any sensors or equipment on or inside his body.

The system also is quite cheaper as compared to other systems, using any lighting unlike other systems using infrared lights.

The foremost task of this process is precise face detection of a person in spite of varying light, different face shapes, hairstyles, glasses or contact lenses. In this step, eye region is extracted from live video and eyeball detection and blink detection is carried out. This localization is extracted with the help of dlib which marks the eye along with other parts of the faces, then, those specific coordinates are processed to detect pupil movements and blink detections.

### Results

The test was conducted on windows 10 with i5 processor with 16GB sd card. Hp webcam was used in the proposed system. The camera mounted in front of the handicapped is adjustable can be adjusted in such a manner that handicapped person does not have to move his any organ except the eyeballs. The threshold time is maintained as 8 sec so while selecting the options the screen does not get turned off or he has to start the system again from the initial steps. The distance between camera and patient is maintained at a distance so that it may avoid any kind of infections to his eyes and recording each motions of his eyeballs.

The non-intrusive methodology is provoked throughout the proposed system.

### Conclusion

The proposed system gives privilege to the handicapped person to express his thoughts, emotion, feelings and desires. The system also makes sure to make the person free from fake sympathy, and also adds on help to the surgeons by exposing the intellectual part of the patient. Thus, the system is quite cost efficient and also can be operated easily by anyone. It does not require any special skills to learn the working of the system. The eye deflection makes the system to function easier which intensifies the patient is looking towards which side. This algorithm also justifies whether blink is intentional or not. The patient is able to navigate through the system. This makes the system cost effective and can also help the medical sector to enhance its values.

# Paper

## ORIGINALITY REPORT

6%

SIMILARITY INDEX

0%

INTERNET SOURCES

6%

PUBLICATIONS

0%

STUDENT PAPERS

## PRIMARY SOURCES

- 1

Milan Pandey, Kushal Chaudhari, Rajnish Kumar, Anoop Shinde, Divyanshu Totla, N.D. Mali. "Assistance for Paralyzed Patient Using Eye Motion Detection", 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBE), 2018

Publication

5%
- 2

Michelle Alva, Neil Castellino, Rashmi Deshpande, Kavita Sonawane, Monalisa Lopes. "An image based eye controlled assistive system for paralytic patients", 2017 2nd International Conference on Communication Systems, Computing and IT Applications (CSCITA), 2017

Publication

1%

Exclude quotes Off

Exclude matches Off

Exclude bibliography On

# Paper

---

## GRADEMARK REPORT

---

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

---

PAGE 1

---

PAGE 2

---

PAGE 3

---