Locomotor Disability Dexterity Interface

A Major Project Phase-I Report

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by

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DECLARATION BY THE CANDIDATE

We the undersigned solemnly declare that the Major project report entitled **"*LOCOMOTOR DISABILITY DEXTERITY INTERFACE*"** is based our own work carried out during the course of our study under the supervision of ***Mr. Abhishek Kumar Saw.***

We assert that the statements made and conclusions drawn are an outcome of the project work.We further declare that to the best of our knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/Deemed university of India or any other country.

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CERTIFICATE BY THE SUPERVISOR

This is to certify that the Major project report entitled **"*LOCOMOTOR DISABILITY DEXTERITY INTERFACE*"** is a record of project work carried out under my guidance and supervision for the fulfillment of the award of degree of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.) India.

To the best of my knowledge and belief the report

i) Embodies the work of the candidate himself

ii) Has duly been completed

iii) Fulfills the partial requirement of the ordinance relating to the B.Tech. degree of the University

iv) Is up to the desired standard both in respect of contents and language for being referred to the examiners.

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The project report entitled ***LOCOMOTOR DISABILITY DEXTERITY INTERFACE*** "has been examined by the undersigned as a part of the examination of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekanand Technical University, Bhilai.

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LIST OF ABBREVIATIONS

ML	Machine Learning
AI	Artificial Intelligence
DL	Deep Learning
CV	Computer Vision
PY	Python
PDF	Portable Document Format
PYNPUT	Python Input
CNN	Convolutional Neural Network
ANN	Artificial Neural Network
GUI	Graphical User Interface

LIST OF FIGURES

ABSTRACT

Disability is a public health issue which is defined as the restriction or lack of ability to perform a task or an activity within the range considered normal for human beings, in locomotive disability a person loses their ability to perform motor functions or in other words partial or complete paralysis, every human being today requires the help of a computer system which requires the ability of fingers. The target of this project is to create a interface which can help the disabled person interact with the operating system through their eyes, Here we are taking the help of the language python which provides us many libraries one of which is OpenCV, which provides us the feature of face detection and eye tracking. A regular person uses a computer with the help of conventional mouse and keyboard, using a mouse to control the cursor and keyboard for typing purposes. A mouse uses a sensor to track the movement across the surface and mimic the movement on the computer and a keyboard has all the alphanumeric keys, which when pressed, types that character as input to the computer. However, both the devices require the use of one's finger to operate, which is not possible in case of a locomotor disabled person. So, our project aims to solve this issue by removing the need of any physical device to give input to the computer. Similar to Stephen Hawking, our project will make use of one's facial dexterity to calculate mouse and keyboard inputs.

Keywords – Locomotor, Disability, OpenCV, Gaze Tracking, Python, Pynputs, Interfaces, Alphanumeric

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CHAPTER-1

INTRODUCTION

1.1 Introduction

A regular person uses a computer with the help of conventional mouse and keyboard, using a mouse to control the cursor and keyboard for typing purposes. A mouse uses a sensor to track the movement across the surface and mimic the movement on the computer and a keyboard has all the alphanumeric keys, which when pressed, types that character as input to the computer. However, both the devices require the use of one's finger to operate, which is not possible in case of a locomotor disabled person. So, our project aims to solve this issue by removing the need of any physical device to give input to the computer. Similar to Stephen Hawking, our project will make use of one's facial dexterity to calculate mouse and keyboard inputs.

Locomotive Disability Dexterity Interface is a boon to the society which basically helps the person with locomotor disability to interact with the technologies present and keep up pace with the current world. This is an initiative of making a GUI interface that will interact with the human and their working senses will interact with the interface to produce a required outcome.

The proposed interface's objective is to make a virtual mouse system which basically identifies retina of the Eyes and administer the mouse operations for an OS, and this can be attained by the help of a webcam that seize the gestures captured and then processes these frames so as to perform definite mouse functions such as left click, right click, and scrolling function.

The project will be made using OpenCV. It is Platform independent and we can develop real time computer vision applications. It aspires to focus on image and video process and can extend an arm to throw lights on face detection and real time image and video processing.

The interpretation of 2D images into 3D models is done by Computer vision using remodeling algorithms, by employing gear and software in computers to clone human visionaries. Now more available than ever, eye tracking is becoming more and more popular among academics working in a wide range of fields.

They have the potential to play an even bigger role in perceptual user interfaces in the future. The method is applied in a variety of fields, including cognitive science, psychology, human-computer interface, advertising, and medical research. A regular person uses a computer

with the help of conventional mouse and keyboard, using a mouse to control the cursor.

A regular mouse uses a sensor to track the movement across the surface and mimic the movement on the computer and a keyboard has all the alphanumeric keys, which when pressed, types that character as input to the computer. However, both the devices require the use of one's finger to operate, which is not possible in case of a locomotor disabled person. So, our project aims to solve this issue by removing the need of any physical device to give input to the computer. Similar to Stephen Hawking, our project will make use of one's facial dexterity to calculate mouse and keyboard inputs. Locomotive Disability Dexterity Interface is a boon to the society which basically helps the person with locomotor disability to interact with the technologies present and keep up pace with the current world. This is an initiative of making a GUI interface that will interact with the human and their working senses will interact with the interface to produce a required outcome.

The main objective of the proposed interface is to make a virtual mouse system which basically identifies points of Eyes/Mouth (Depending upon the disability) and control the mouse functions for an OS, and this can be achieved with the help of a web camera that captures the gestures captured and then processes these frames to perform the particular mouse function such as left click, right click, and scrolling function.

The project will be made using OpenCV. It is a cross-platform library using which we can develop real- time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection. Computer Vision can be defined as a discipline that explains how to reconstruct, interrupt, and understand a 3D scene from its 2D images, in terms of the properties of the structure present in the scene. It deals with modeling and replicating human vision using computer software and hardware.

1.2 Introduction to Gaze Tracking

An eye tracking and detection process is divided into four steps: Face detection, eye region detection, pupil detection and eye tracking. For each step different approaches and algorithms are available. To take images of person's face Hough transform algorithm is used. To detect eye Haar-like features are used, Haar classifiers are already available in OpenCV. To detect eye Haar cascade classifier is used which is present in OpenCV API. Haar

classifiers are trained with a few thousand of sample view images of object and cascade is constructed to detect eye rapidly. Mean shift algorithm is used for segmentation of eye images. Pupil position is not constant always, for accurate pupil localization Kalman filtering is used.

1.2.1 Categories

a. **Sensor Based Eye Tracking (EOG):** Some eye tracking system makes use of electric potentials measured with electrodes placed in the region around the eyes called as electroculogram. This is done to detect eye and analyze the movement of eyes. The electrode becomes steady when eyes are in their original states. Eye movements can be tracked by analyzing the changes in EOG signal data.

b. **Computer Vision Based Eye Tracking (OpenCV):** An Many eye tracking presented in literature use computer vision based eye tracking techniques. In these methods camera is set to focus on one or both eyes and record the eye movement. There are two main areas investigated in the field of computer vision based eye tracking. One is eye detection in the image, also known as eye localization. The second is eye tracking, which is the process of eye gaze direction estimation. There are many issues associated with this type of tracking such as degree of eye openness, variability in eye size, head pose, etc. Different applications that use eye tracking are affected at different levels.

1.2.2 Algorithms

a. **Patter Recognition for Eye Tracking:** Pattern recognition techniques such as template matching and classification are effective in the field of eye tracking .Artificial Neural Network (ANN) is used to classify the pupil position. The training data required for ANN is gathered during calibration.

b. **Eye Tracking Based on Corneal Reflection Points:** Reflection points on cornea are used my many computer vision based eye trackers to estimate gaze direction. Images containing corneal reflection points are also called as Purkinje Images. To compute the gaze direction vector between the center of pupil and corneal reflections is used.

c. **Eye Tracking Based on Shape:** This is also one of the popular approaches of tracking eye and detecting eye pupil, iris based on the circular shape or edge

detection. Hough transform for eye detection is applied to facial images. First step is detection of face based on existing face detection method. Then the eye is searched based on circular shape of eye in a two dimensional image.

d. **Eye Tracking using Dark and Light Pupil Effects:** There are two illumination methods used for pupil detection, one is dark pupil and another is bright pupil method. In dark pupil method, the location of dark pupil is determined in the eye image captured by camera. The bright pupil method uses the reflection of infrared light from retina which makes pupil appear white in the eye image.

e. **Eye Tracking using Eye Models:** Eye models are used for eye tracking. The cornea of eye is modelled as a convex mirror. Eye's 3-D optic axis is estimated based on the characteristics of convex mirror. The visual axis represents the actual 3-D eye gaze direction of the user. The schemes in this are very complex and hence they are not applicable for real time eye tracking.

1.3 Implementing GUI as the Middleman

Using the eye movements to calculate actions has proven very useful. Almost every input actions can be performed by just the gestures of the user's eyes. However, using the movements of the eyes put a lot of strain on the user as it requires pinpoint precision and slow and steady movements. And the human eyes are very quick and jerky in that regard.

So, to overcome this issue, this projects aims to include GUI as the middleman. For instance, if the user wants to open a file, the GUI will already have pre-programmed instruction on how to open a particular file. So, the user only has to give command to the GUI to perform this task.

The main aim of including GUI to this project is to reduce the strain on the eyes of the user, by pre-programming heavy and complex tasks (such as copying files, opening an application, providing input from keyboards, etc), and allowing the GUI part to handle the heavy loads. Since the movements of the eyes put a lot of strain on the user as it requires pinpoint precision and slow and steady movements. And the human eyes are very quick and jerky in that regard. This will not only save the user's eye from strains, but it will also improve the functionality and usability of the interface.

1.4 Applications of this Project

a. This project will help people with paralysis or disability by aiding them to use a computer system easily and efficiently.

b. There will be no need of any physical device such as a mouse or keyboard.

c. The inputs will simply be given by the interface which will capture the user's facial dexterity and perform all the needed actions.

d. By removing the need of any kind of physical device, the cost of maintenance of the computer system reduces.

e. A person suffering from said disability will be able to become more productive in their field of work.

f. More and more people will get access to computers with the help of this project.

g. The GUI will provide a visual interface, thus making it easier to traverse the controls and use the computer system.

h. It's very easy and quick to master.

i. There is no prior knowledge is required to use this interface.

j. 10 Searching the controls becomes very easy.

k. This project can also be used in other fields such as Virtual Reality, gaming, holograms, robots, etc.

1.5 Computer Vision

Artificial intelligence AI's of computer vision enables computers and systems to extract useful information from digital photos, videos, and other visual inputs and to conduct actions or offer recommendations in response to that information. If AI gives computers the ability to think, computer vision gives them the ability to see, observe, and comprehend.

Human vision has an advantage over computer vision in that it has been around longer. With a lifetime of context, human sight has the advantage of learning how to distinguish between

things, determine their distance from the viewer, determine whether they are moving, and determine whether an image is correct or not.

1.5.1 Image Classification

The challenge in image classification is to predict the categories for a brand-new set of test photos and evaluate the predictions' accuracy given a set of images that have all been assigned to a single category. This problem has a number of difficulties, including as perspective and size variation, intra-class variation, image deformation, image occlusion, lighting issues, and backdrop clutter.

1.5.2 Object Detection

In order to define items inside a picture, bounding boxes and labels for each object are often output. This is different from the classification and localization task in that numerous objects are classified and localized, as opposed to only one dominant object. There are just two categories for classifying objects: object bounding boxes and non-object bounding boxes. For instance, in car detection, you must identify every car in an image by using its bounding boxes.

1.5.3 Object Tracking

Following a single object of interest, or a number of objects, in a scene is referred to as object tracking. When observations are made after an initial object detection, it typically finds use in video and real-world interactions.

CHAPTER-2

PROBLEM IDENTIFICATION

AND

LITERATURE REVIEW

2.1 Problem Identification

The According to the People with Disabilities Act of 1995 "Locomotor disability" means disability of the bones, joints or muscles leading to substantial restriction of the movement of the limbs or any form of cerebral palsy. Locomotor Disability means restriction in the movement of the limbs (i.e. arms and legs). Locomotive disability is also known as mobility disability.

The percentage of persons with locomotor disability is the highest among the total disabled population of India constituting a sizable portion of 20.3 percent population of total individuals with disabilities. The people with locomotor disabilities face difficulties to use one or more of his/her extremities, or may have lack of strength to walk, grasp, or lift objects. Assistive devices like wheelchair, crutches, or a walker may be utilized to aid in their mobility.

The major types of locomotor disabilities are musculoskeletal, congenital malformation, accidents and other chronic disabilities such as polio, rickets, spinal bifida, congenital deformities of hip/s and limb/s, deformities of spine and muscular dystrophy. Thus, a person suffering from locomotor disability is unable to use a normal computer system, hence reducing his/her productivity. An interface is something which allows communication or control flow between two or more systems. For example, an operating system is an interface between the user and the computer hardware.

A dexterity interface will allow the user to control the computer using only their facial dexterity. Thus, removing the need of a physical device such as a mouse or keyboard. This interface was inspired by the theoretical physicist Stephen Hawking, who was also a paralyzed and physically challenged. Hawking previously used his finger to control a computer and voice synthesizer. But once he lost use of his hands, he started depending on twitching a cheek muscle to communicate. Most computers designed for him relied on running lists of words. Whenever the cursor reached a word or phrase he wished to use, Hawking twitched his cheek muscle to select it. Then he'd go on to the next word until he created a sentence.

2.2 Literature Review

Crop's Eyes are the most important of our senses it helps gather information and knowledge about the external world. So vision are important part of the whole body, the way we gaze through our eyes, the way we move our eyes or track an object throw our vision is associated with how we pay attention of our environment [1]. HCL used a method for eye gaze tracking which was proposed by Kyualg Nam Kim and S.R. Ramakrishnan by which eye gazing can be taken as input for the efficient use of computer interface, movements of the eyes where the focus of the research paper [2].

Ware and Mikaelian researchers presented some experiment for HCL, where some simple operation like positioning of the cursor and target selection were achieved, there are many techniques being used today by the industry for eye tracking [3]. OpenCV is platform independent means it can be used in any operating system like Windows, Linux, MacOS and etc. Concluding it means it is multi-platform framework, OpenCV has many capabilities and features if one can understand its working correctly, its functionality are many some of which are face detection and eye tracking [4].

OpenCV library is used in a research by the author Vandna Singh to apply Haar cascade classifier, to detect a face using Haar cascade classifier author uses two features of Haar i.e. firstly a image containing light background with slightly affected by illumination while the second one is majorly affected by illumination with complex background, Author used the default frontal face [5]. Using OpenCV for real-time face detection research paper by the author Mamta S.Kalas used three different algorithms for face detection that are Haar cascade, adaboost, template matching. The paper also describes about the applications of face detection [6]. The research paper on facial detection by Shervin Emami and Valentin Petrut Suciu used an open source computer vision, OpenCV, and the.NET framework to create an application that grants users access to equipment based on a thorough analysis of human facial motions. [7]. Facial detection and recognition is a application of image analysis and algorithm based calculations it is not only area of computer science or machine learning it has become a part of neuro-scientific and psychological studies to provides insights on how a human brain works [8].

Fabian Timm and Erhardt Barth in their paper Accurate Eye Centre Localization by Means of Gradients stated that many computer vision method fails in detecting eyes because of low resolution, low contrast or occlusions. So, they used the idea of image gradients which works simple objective function only consisting of dot products [9]. Gesture Recognition Based Mouse Events by author Rachit Puri states that recognizing gestures is a complex task which involves task like motion modeling, motion analysis, pattern recognition and machine learning [10].

V. Upasana, M. Joseph and Kanchana Venkatasubbaiah author states in their paper Virtual Mouse with RGB colored tapes that the application developed by them using Human-Computer Interaction approach seeks to perform or control mouse cursor tasks using a camera and computer vision technologies like gesture recognition. [11]. Eye movement is the subject of research in this field because eye-gaze is an input that has the potential to create an effective computer interface, a small 2D mark is employed as a reference to compensate for this movement [12].

CHAPTER-3

PROPOSED METHODOLOGY

3.1 Overview of Important Gaze Tracking Functions

3.1.1 **Horizontal Ratio**: This method calculates the relative distance of the pupil from the left most corner and the rightmost corner. If the pupil is closer to the left corner, the user is detected as looking left. Similarly, if the pupil is closer to the right corner, the user is detected as looking right. This function returns this ratio in a range of 0 to 1. The user is said to be looking left if the value ranges from (0 – 0.45), looking center if the value ranges from (0.45 – 0.55), and looking right if the value ranges from 0.55 to 1.

3.1.2 **Vertical Ratio**: This functions is similar to the Horizontal ratio, with one difference that it provides the pupil's vertical location rather than the horizontal one. If the pupil is closer to the top of the eye, the user is detected as looking up, and if the pupil is closer to the bottom of the eye, the user is detected as looking down. It also returns a value that ranges from 0 to 1.

3.1.3 **Blinking Ratio**: This function makes use of the distance of the pupil from the top of the eye and from the bottom of the eye. Then, it compares the sum of this distance to the original distance as gathered from the face recognition, and then return this value as a ratio ranging from 0 to 1. As this return value approaches 0, the user is detected as blinking, and as this value approaches 1, the user is detected to have opened eyes.

3.2 Overview of Important GUI Functions

3.2.1 **Open Selected Folder**: This method will allow the user to open the currently selected folder.

3.2.2 **Open Selected Application**: This method will allow the user to open the currently selected application

3.2.3 **Cycle through**: This method will allow the user to linearly select the folder/application, and the selected one will be opened by subsequent user.

3.2.4 **Copy**: This method will allow the user to directly copy the selected item.

3.2.5 **Paste**: This method will allow the user to directly paste the selected item

3.2.6 **Close**: This method will allow the user to close the current window

3.2.7 **Go Back**: This method will allow the user to go to one directory up the current directory

3.3 Diagrams

3.3.1 Work Flow

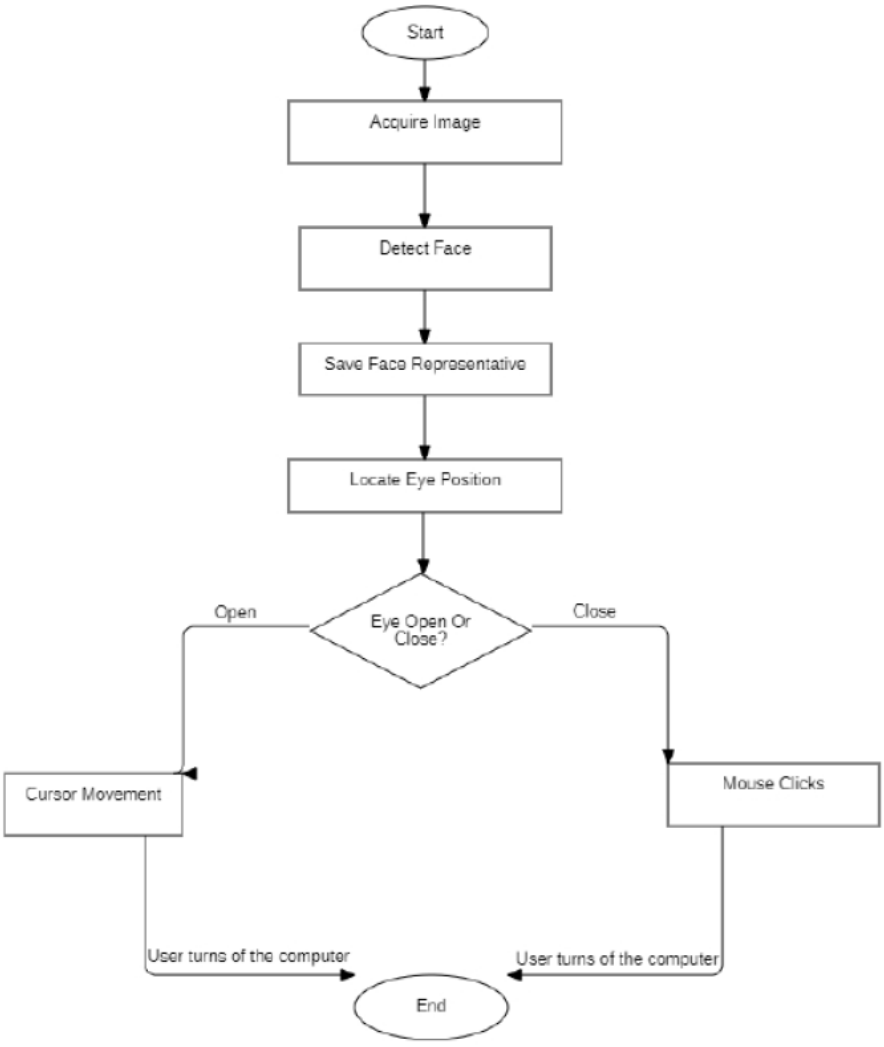

Figure 3.1: Flow chart of all the steps performed for actions

3.3.1.1 Acquire Image

Firstly, as soon the system boots, the interface automatically launches as a startup application. The interface launches the camera, which starts to acquire the images like background, foreground, etc.

3.3.1.2 Detect Face

Once the image is captured, the interface recognizes the face of the user with the help of OpenCV Library. This allows the interface to plot points on the eyes of the user. These points allow us to calculate horizontal ratio, vertical ratio, blinking ratio, etc.

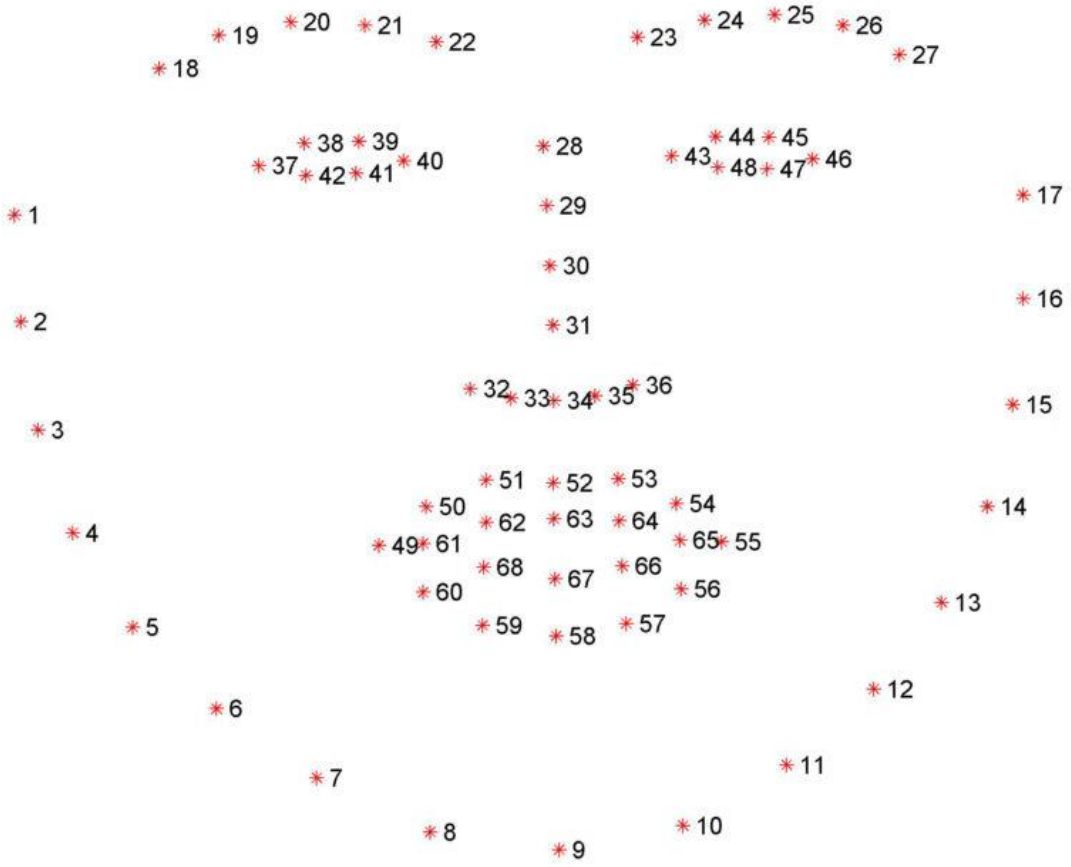

Figure 3.2: Face Representative of an OpenCV Gaze tracking Module

3.3.1.3 Save Face Representative

In this step, the landmarks of the eyes of the users are stored, to calculate and detect any movements performed in relation to the previous state.

3.3.1.4 Locate Eye Position

Finally, after the face has been detected, the interface tries to find the dimensions and locations of the user with the help of OpenCV and DLib library. It's crucial to save the face first because it increases the accuracy of the plotting of eyes.

3.3.1.5 Detecting Eye Functioning

In this step, the interface tries and detects any movements like horizontal, vertical, or blinking of the eyes of the user. Firstly, if checks whether the eyes of the user are open or not. If the eyes are open, actions like cursor movements are performed, and if the eyes are closed, subsequent mouse click actions are performed.

3.3.2 Use Case Diagram

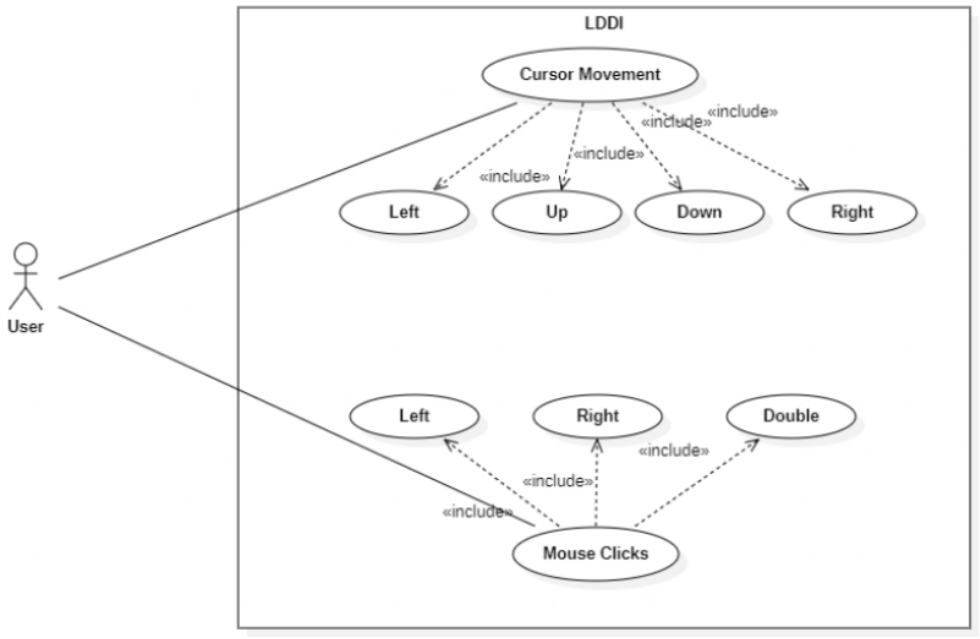

Figure 3.3: Use Case Diagram

In the above figure, we show the relationship between the user and the LDDI Interface. The user can mainly interact with the interface using the following two features:

a. Cursor Movements, which is further divided into left, right, up and down
b. Mouse Clicks, which is further divided into left, right, and double clicks

3.3.3 Sequence Diagram

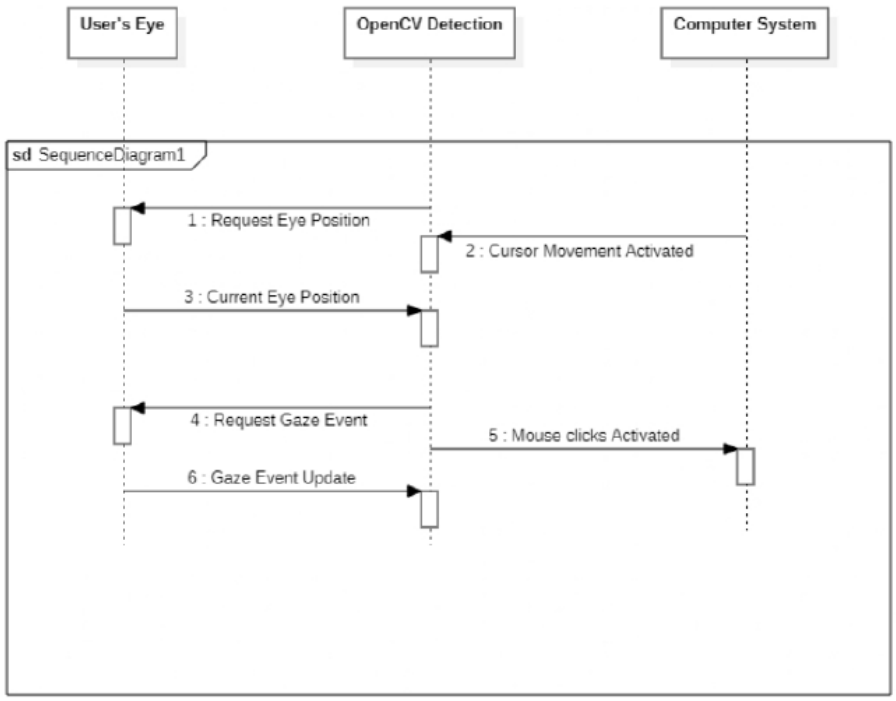

Figure 3.4: Sequence Diagram

In the above figure, sequence between the components of the interface is being demonstrated.

a. The system first requests current eye position of the user. Once it captures it, it then performs subsequent actions mapped to the gesture.
b. Along with the user's eye position, the system also requests for the gaze events performed by the user.
c. Once the system gathers enough events, it activates that segment of the mouse.

3.4 Software Requirements:

a. Pycharm:

PyCharm is the most popular IDE for Python, and includes great features such as excellent code completion and inspection with advanced debugger and support for web programming and various frameworks. PyCharm is created by Czech company, Jet brains which focusses on creating integrated development environment for various web development languages like JavaScript and PHP.

b. OpenCV:

OpenCV is a Python open-source library, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition, etc. The purpose of computer vision is to understand the content of the images. It extracts the description from the pictures, which may be an object, a text description, and three-dimension model, and so on. For example, cars can be facilitated with computer vision, which will be able to identify and different objects around the road, such as traffic lights, pedestrians, traffic signs, and so on, and acts accordingly.

c. Tkinter(GUI):

GUI stands for Graphical User Interface, and refers to computer programs that provide a visual means for users to interact with an underlying application or system. For example, the GUIs on our mobile phones allow us to interact with different functions through the display, which we can touch, tap, and swipe on.

3.5 Hardware Requirements:

a. Webcam:

A video camera that faces the user. Webcams are built into laptops but are separate units that attach to the monitor of a desktop computer. A Webcam is used for video calling and taking selfies, and although most models include a microphone, many users opt to use headphones for better audio quality.

b. Core i3 Processor or better :

The Core i3 processor is available in multiple speeds, ranging from 1.30 GHz up to 3.50 GHz, and features either 3 MB or 4 MB of cache. It utilizes either the LGA 1150 or LGA 1155 socket on a motherboard. Core i3 processors are most often found as dual-core, having two cores.

c. RAM (4GB or Above):

RAM is short for "random access memory" and RAM is one of the most fundamental elements of computing. RAM is the super-fast and temporary data storage space that a computer needs to access tight now or in the next few moments.

CHAPTER-4

RESULT

4.1 Snapshots with Description

Figure 4.1: Looking Center

The first function of our interface is, when the user is looking directly at the center, the interface must not perform any actions and wait for further gestures of the user. We determine when the user is looking at the center by calculating the horizontal ratio. If the horizontal ratio of the eyes are ranging from 0.45 to 0.55, the pupils are located at the center.

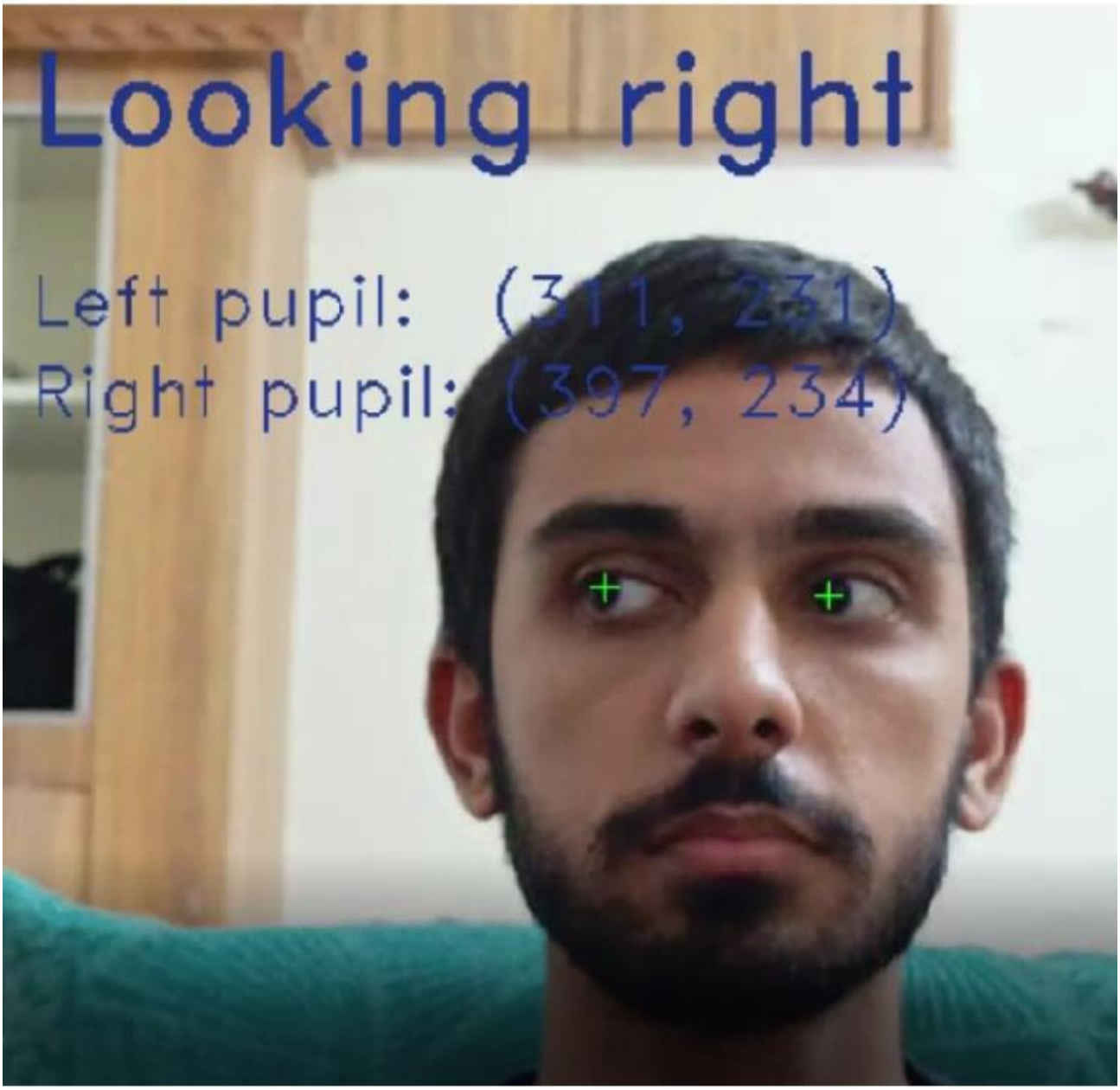

Figure 4.2: Looking Right

The next function of the LDDI interface is to detect when the user is looking right, and when the user is looking right, the interface will start moving the cursor to the right. We determine when the user is looking right by calculating the horizontal ratio. If the horizontal ratio of the eyes are ranging from 0 to 0.45, the pupils are located at the right.

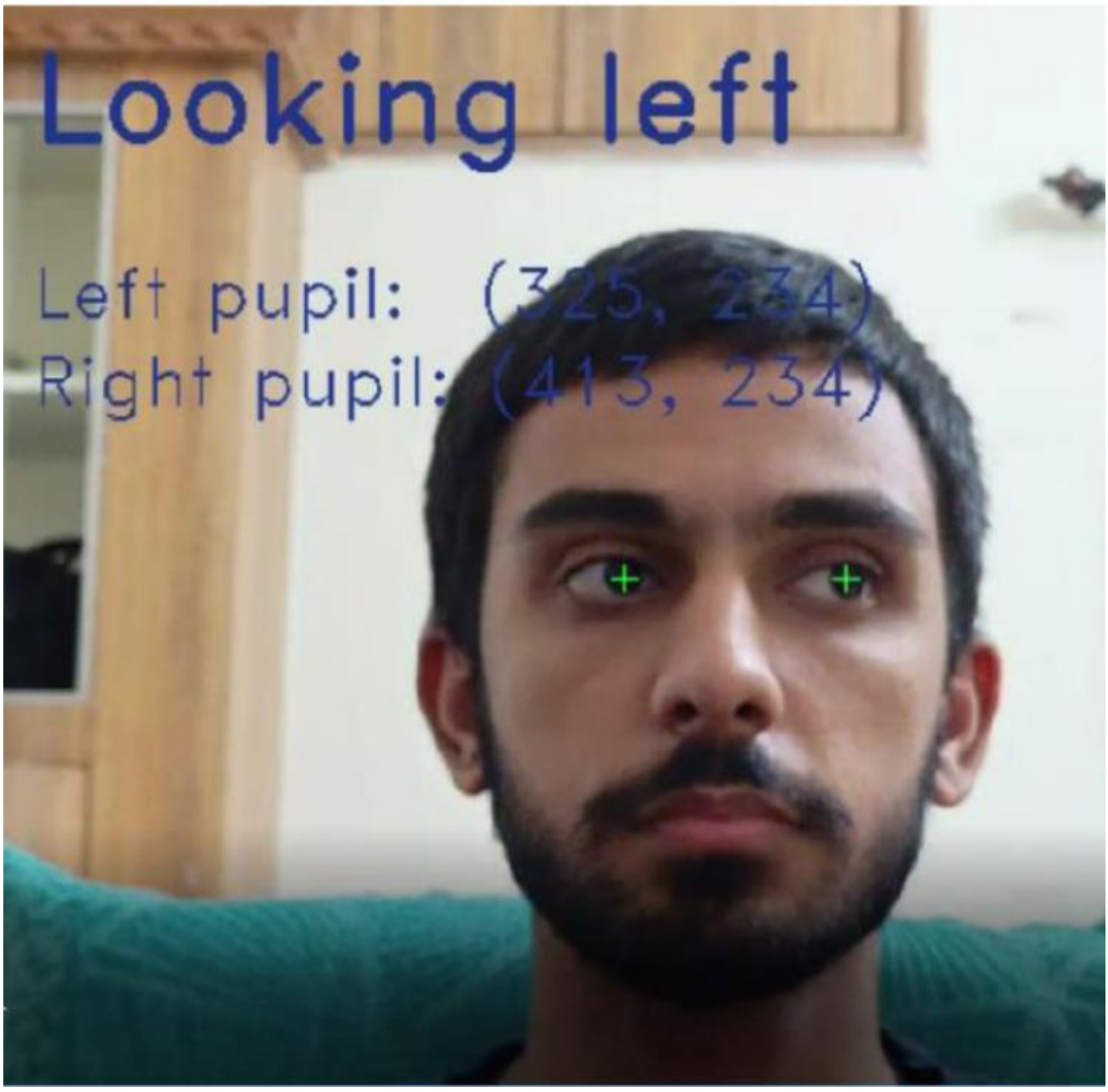

Figure 4.3: Looking Left

The next function of the LDDI interface is to detect when the user is looking left, and when the user is looking left, the interface will start moving the cursor to the left. We determine when the user is looking left by calculating the horizontal ratio. If the horizontal ratio of the eyes are ranging from 0.55 to 1, the pupils are located at the left.

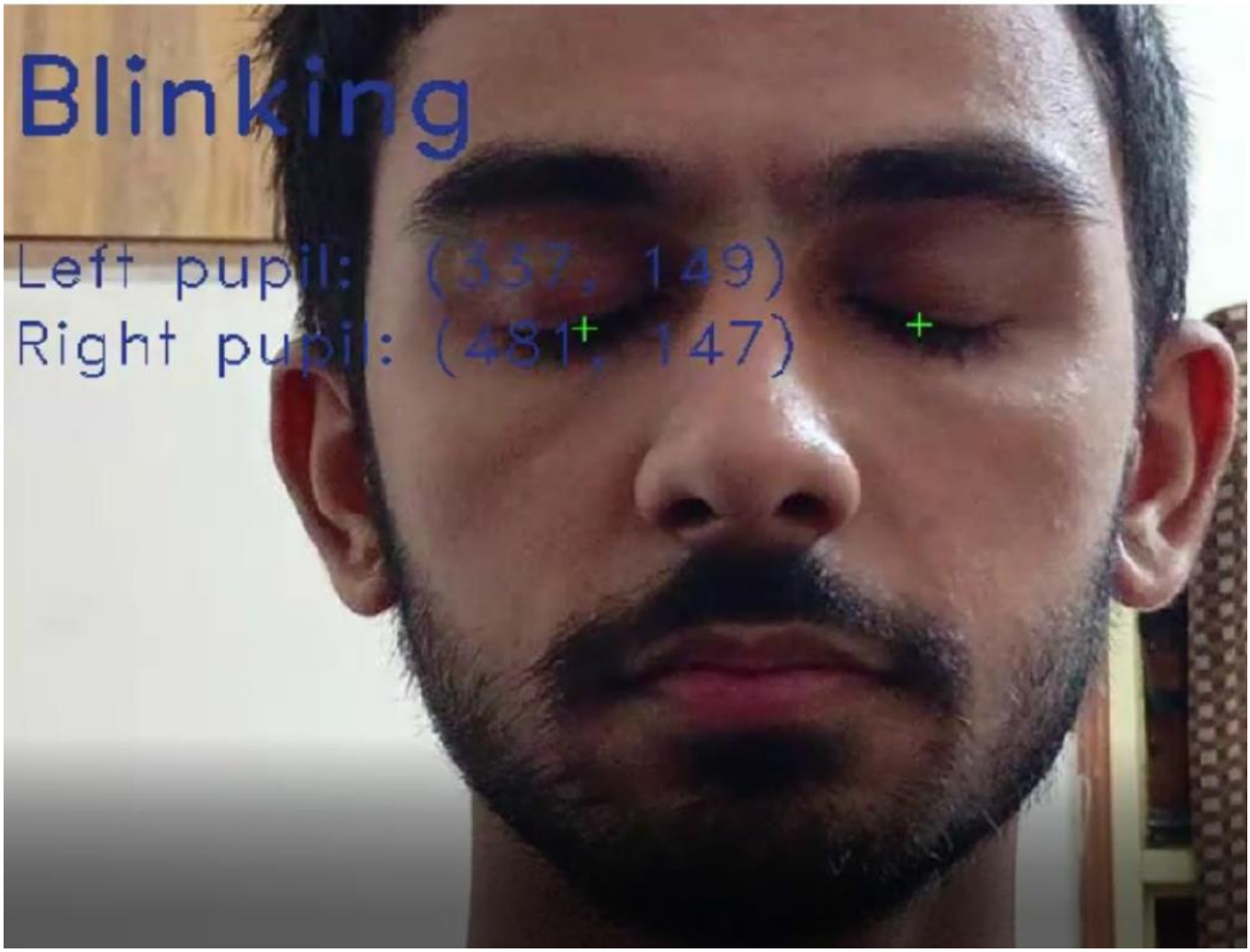

Figure 4.4: Blinking

This is the state when the user is blinking. In case of a blink, the interface performs mouse click actions. So, for left click the user has to blink his left eye, and for right click, the user has to blink his right eye.

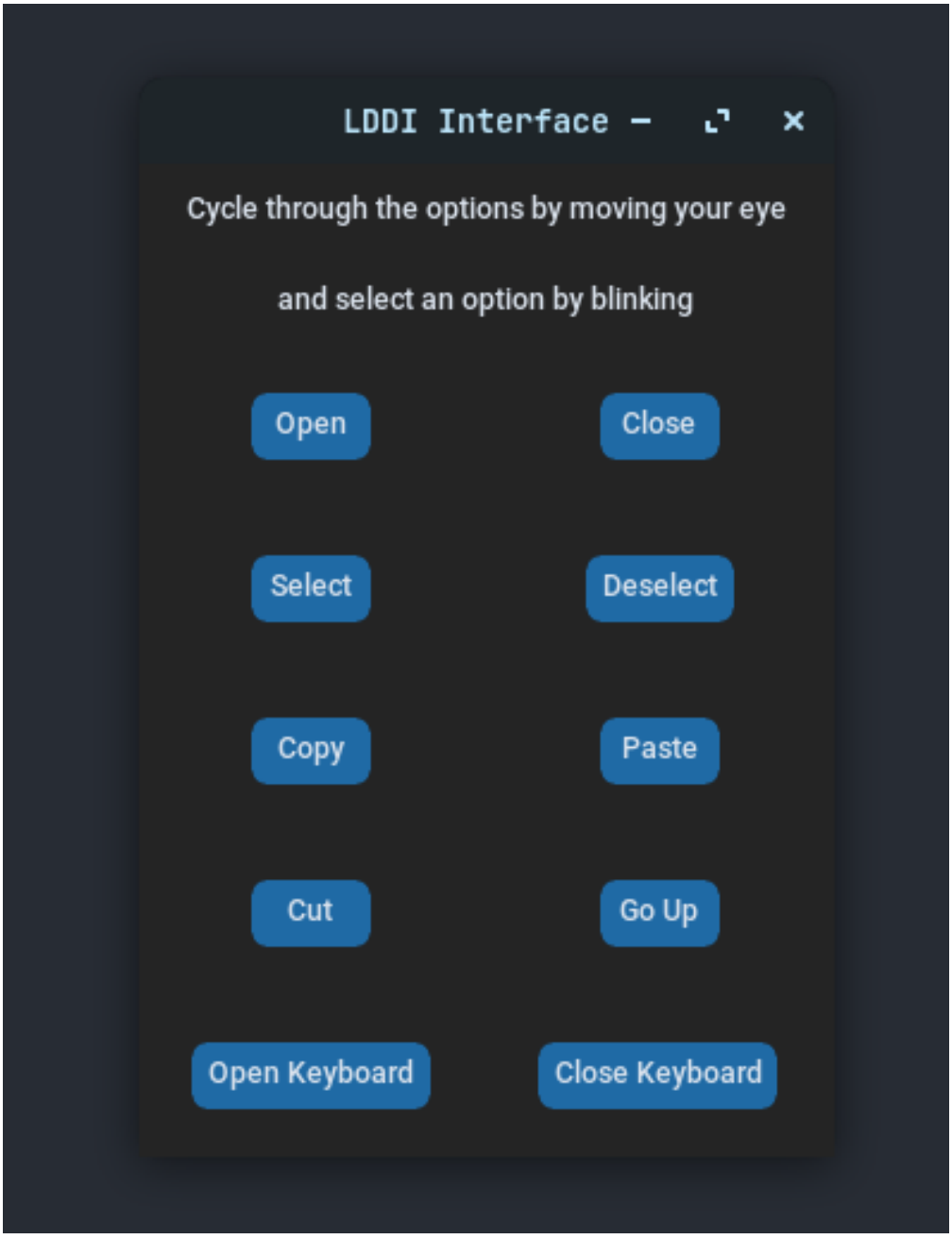

Figure 4.5: GUI Interface

This is the interface that the user will interact with. It contains some of the most useful and most recently required operations. The user only has to navigate through these buttons and click on the desired action, as opposed to performing all the steps directly with the movement of their eyes.

CHAPTER-5

CONCLUSION

5.1 Conclusion

With the help of this project, any person suffering from locomotor disability will be able to use a regular computer with relative ease. This project made use of Computer Vision and modern GUI, which allows users to navigate and operate a regular computer system.

Modern society strives to make its world smart. The ability to use a computer is a skill that every individual has a right to achieve. This project will help anyone and everyone with locomotor disability to easily use a computer system and increase their productivity without the need of any physical input device.

The interface will use facial dexterity such as eye movements, and blinking to perform mouse control actions such as cursor movement and mouse clicks. OpenCV will detect the pupil coordinates and give it as a value to the cursor. And, the GUI will provide enough one-click functions which the user can easily navigate through, and use their computer system.

The end user will only need a good quality camera to make use of the interface to browse the computer system.

5.2 Future Scope

Although the ocular dexterity of the user can somewhat replace the need for physical input devices like mouse, keyboard, etc. It's still not the best option for this issue. Added features like computer system control through complete facial gestures will drastically improve the usability of this interface.

So, in the future, we aspire to take this project further by adding the following functionalities:

a. Added functionality of mouse control with the entire face.
b. Added voice recognition control system.
c. Added functionality of improved keyboard controls
d. Optimal design of the system

5.3 Limitations

Some of the limitations of the current project are

a. Although majority of operations are available to the user, the user still needs help

from other people in order to setup and install the first setup of the interface.

b. The interface is heavily dependent on the quality of the camera at use. A weak camera may lead to faulty facial recognition and gaze tracking, which can cause unnecessary actions.

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Locomotor Disability Dexterity Interface

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***Abstract*— Disability is a public health issue which is defined as the limitation or inability to accomplish a task or activity within the parameters thought to be typical for humans, in locomotive disability a person loses their ability to perform motor functions or in other words partial or complete paralysis, every human being today requires the help of a computer system which requires the ability of fingers. The target of this project is to create a interface which can help the disabled person interact with the operating system through their eyes, Here we are taking the help of the language python which provides us many libraries one of which is OpenCV, which provides us the feature of face detection and eye tracking.**

***Keywords*— Python, OpenCV, Face Detection, Eye Tracking**

I. INTRODUCTION

A regular person uses a computer with the help of conventional mouse and keyboard, using a mouse to control the cursor and keyboard for typing purposes. A mouse uses a sensor to track the movement across the surface and mimic the movement on the computer and a keyboard has all the alphanumeric keys, which when pressed, types that character as input to the computer. However, both the devices require the use of one's finger to operate, which is not possible in case of a locomotor disabled person. So, our project aims to solve this issue by removing the need of any physical device to give input to the computer. Similar to Stephen Hawking, our project will make use of one's facial dexterity to calculate mouse and keyboard inputs.

Locomotive Disability Dexterity Interface is a boon to the society which basically helps the person with locomotor disability to interact with the technologies present and keep up pace with the current world. This is an initiative of making a GUI interface that will interact with the human and their working senses will interact with the interface to produce a required outcome.

The proposed interface's objective is to make a virtual mouse system which basically identifies retina of the Eyes and administer the mouse operations for an OS, and this can be attained by the help of a webcam that seize the gestures captured and then processes these frames so as to perform definite mouse functions such as left click, right click, and scrolling function.

The project will be made using OpenCV. It is Platform independent and we can develop real time computer vision applications. It aspires to focus on image and video process and can extend an arm to throw lights on face detection and real time image and video processing.

The interpretation of 2D images into 3D models is done by Computer vision using remodeling algorithms. employing gear and software in computers to clone human visionaries.