Cursor Control Using Eyes and Face Tracking

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Abstract – The description of this system allows people to use computers without touching them. People now control things differently, instead of using a mouse with their hand, they use their eyes and their face. It uses different ways to work with pictures, like finding faces and eyes, and understanding how people blink. This helps to control a computer without touching it, in a way that doesn't bother the person using it. Instead of using a mouse, people can move their eyes to control a computer. It takes a picture with a regular camera that attaches to your computer.

Keywords: Human Computer Interaction(HCI), facial-recognition, eye-movements.

I. INTRODUCTION

For quite some time now, there has been a conjecture about computers being able to interact with humans in a more natural or direct manner, without the need for intermediate tools such as handheld input devices, keyboard, and mouse. The computer must accommodate human instinctive sensing and perceptual tendencies. The perceptual user interface, also known as human computer interaction, involves using video input for the computer to monitor and interpret human movement.

The utilization of video input devices such as camera to record human motion enables the control of mouse movements through said motion, as both are synchronized with the locked computer. Out of all the body parts, the face has garnered the most focus in research pertaining to visual human tracking and interaction with computers. Several proposals have been put forth regarding the utilization of mouth, nose, and even eye gestures for regulating a computer mouse.

The primary goal is to present a visual eye and face movement tracking camera that enables hands-free control of cursor movements. The possibility of using handheld devices as a workable solution for human-computer interaction has emerged. The actions performed by our mouths, eyes, and faces can be categorized into two distinct groups: rigid movements such as rotation and translation, as well as non-rigid movements like the act of opening and closing.

Through the creation of a visual and eye tracking mechanism, it becomes possible to obtain precise and elaborate measurements regarding movement in live time. The orientation and translation can be controlled by the movements of the mouse pointer, while the detection or slight changes can be utilized to activate mouse events.

Using physical handheld input devices like a mouse and keyboard is not feasible for everyone in the world, as some individuals may have varying abilities such as physical disabilities, autism, or other conditions. If they aim to communicate with the computer, the handheld input devices will prove to be quite challenging for them. The most suitable option for these individuals would be to establish direct communication with the computer solely through their facial movements and eye recognition. Communicating directly with their computer can be facilitated through the use of their facial movements, specifically involving their face, mouth and eyes.

The use of cameras mounted on computers is crucial for achieving facial and ocular tracking, which are essential for effective human-computer communication. These cameras follow and map the movements of the face, mouth and eyes, which in turn trigger and control the cursor's movements and controls. Thus, they will perform comparable actions to those executed with a handheld mouse device by others.

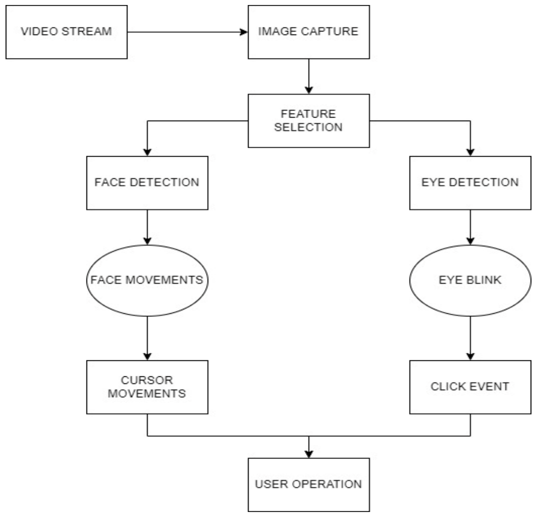

Figure 1 : System Design

From this system design, we can analyse ourselves on how this system works for the operation of cursor control. The images are captured from the webcam mounted on the computer as a stream of video input, the images are captured at around 30 frames per second. Through those images the system identifies the users face, mouth, and eye for the operation. If the user wants to go for face movements, the system will recognize face and if the user wants to go for eye as blinking, then the system will recognize eye detection. Suppose if the user chooses for face for the movement operation, the system will track the movements and map those face movements to the of computer cursor for operation and also if the user wants clicking operations to select an icon on the screen, the system identifies the eye blinking as the click operation.

II. PROBLEM STATEMENT

The issue of conventional computer input mechanisms such as a touchpad or mouse being inaccessible or inefficient for people experiencing physical disabilities or impairments that impact their manual dexterity constitutes a longstanding challenge. In instances of this nature, the application of eye and facial tracking technology may offer a viable alternative means of directing the motions of the mouse cursor. The task at hand is to formulate a dependable and precise system that can proficiently interpret eye and facial cues and facilitate accurate cursor movements on the screen, whilst ensuring that the user does not experience any fatigue or discomfort. An important challenge associated with the implementation of eye and face tracking technology concerns the inherent inter-individual variations in eye and facial movements that users may exhibit, thereby complicating the development of a uniform solution applicable to all. To illustrate, certain individuals may encounter challenges in governing their ocular movements stemming from an underlying condition such as nystagmus. Additionally, there may be others who experience restricted mobility in their facial musculature, impeding their ability to identify particular facial expressions. Consequently, a system that is customizable and adaptable is necessary to accommodate the divergent eye and facial movements of individual users. Developing a system that is simultaneously accurate and responsive poses a noteworthy challenge, given that even minor lag in the movement of the cursor may lead to user frustration and reduced efficacy. Furthermore, it is imperative to design the system in such a way that it mitigates the occurrence of eye and facial fatigue.

The prolonged use of the eye and facial muscles can lead to discomfort and strain, hence the need to minimize its impact. Achieving a suitable equilibrium between precision and accuracy requirements and users' comfort and well-being poses a considerable challenge for the system. Furthermore, it is imperative that the system embodies a high degree of user-friendliness and ease of use, especially concerning individuals possessing a restricted degree of technological aptitude. It is imperative that the user interface is designed in a manner that is intuitive and straightforward for users to operate with minimal guidance. The interface should provide clear instructions and necessitate minimum setup requirements. In addition, it is imperative that the system demonstrates compatibility with conventional operating systems and software applications to ensure seamless user performance and continuity of preferred programs and workflows.

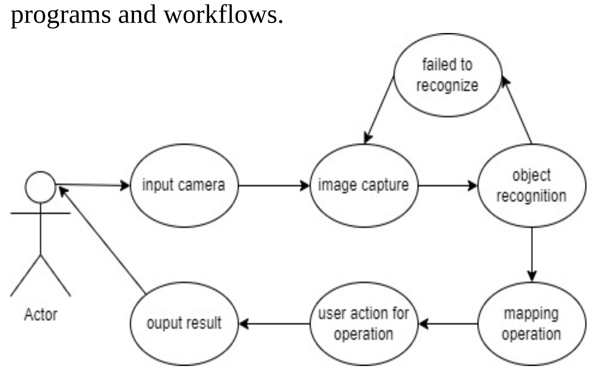

Figure 2 : Use Case Diagram

III. RELATED WORK

Pavithra and et al, have proposed a touchless communication system connecting people and computers. The traditional use of a computer mouse has been supplanted by the utilization of human facial characteristics and attributes. The interface between humans and computers utilizes image processing methods including detecting faces and extracting eyes, as well as interpreting the sequence of blinking eyes in real time. The webcam is mainly utilized to record video by initiating the image capture process. The commencement of the procedure involves the extraction of every frame detected in the recorded video, with a standard frame rate of 30 frames per second. The loop involves a sequence of operations performed on every frame, which is then graphically represented at the cursor position. The facial area is being identified by utilizing pointers on the face like the edges of the eyebrows, eyes, corners of the mouth, nose, and jawline. It has been effectively utilized for tasks such as face alignment, determining head orientation, swapping faces, identifying eye blinks, and numerous others. The system identifies the area around the eyes and determines the exact position of the eyes. It also differentiates the direction of eye movement and tracks the position of the cursor based on these movements. Developing precise user interface details demands complex computational models and designs that may come at a lofty cost. Failure to have a suitable webcam could impede the system's proficiency in identifying the user's eye movements and facial expressions necessary for categorizing and managing the interface. The system displays an impressive level of adaptability, which allows for adjustments to be made easily. Additionally, the system can improve its performance by incorporating other body parts, including hand and finger movements, alongside facial and eye controls to expand its capabilities. [1]

Manish and et al, have proposed an effective method of communication between individuals and computers that doesn't require the use of hands, can be achieved through the use of an algorithm. Apply computer vision technology to detect a range of facial expressions exhibited by humans, match them to pre-existing expressions, and execute the corresponding responses. The system permits the use of left or right clicks of the mouse, scrolling up or down, and navigating the cursor in any direction (left, right, up, or down). The algorithm for face detection is employed to identify a person's facial features, particularly their eyes and lips, to enable mouse control functions such as cursor movements and left- or right-clicks. The device continually scans its surroundings, searching for a face to photograph at a rate of 30 frames per second. If a face is recognized, it verifies whether the face control feature is enabled or disabled. It activates the facial recognition feature to perform specific actions based on the orientation of the face provided. In order to scroll through the page, the individual may choose to vertically move their head. Consequently, the only action required by the user to manipulate the cursor is to rotate their head. A supplementary function introduced here requires us to open and shut our mouths to trigger and disable the cursor control feature. Similarly, the act of scrolling also requires the user to strain their eyes in order to activate or deactivate, leading to an additional step in the process. This system has the ability to adjust to different types of computers regardless of the type of webcam used by the other party or the individual facial and eye characteristics of the other users. [2]

Sharon and et al, have introduce the idea of utilizing an eye tracking mechanism to capture eye motions and manage the computer mouse cursor for individuals who solely rely on their eyes for movement. The process involves identifying the position of eyes within an image and obtaining their coordinates by utilizing facial landmark detection. To simplify and eliminate unnecessary elements, it is recommended to convert the RGB image into a gray image. Obtain an array of values representing the eyes. Adjust the values of the array to monitor the movements of the eye. Once you have compared the initial and new arrays, map the values in the array to match the coordinates of the cursor. Pre-existing models are utilized in the facial landmark detector to recognize and track the eye's motion. In Python, the dlib package can be utilized to approximately determine the positions of all the facial points' coordinates that correspond to a person's face. The dlib library comprises a pre-existing detector for facial landmarks. A set of rectangle vectors is produced which includes the initial image's faces and the identified face rectangles. The model that incorporates hardware devices to automate various household equipment will require ample time for implementation and will also involve the purchase of pricey electronic parts. Automating every essential device may also have an adverse effect on its efficiency, leading to rapid deterioration. The current prototype has potential to enhance its capability of detecting emotions and showcasing an uplifting statement to the individual. A safety alarm can double as a fatigue detector, serving two purposes. [3]

Kushal and et al, have proposed an evidence to support interaction between humans and computers. This prototype's headgear employs two distinct signals. There are two distinct actions involved - the first being a natural movement of the head to position the cursor, while the second is a quick contraction of the cheek muscles to activate the pointer. Flex sensors are employed for head motion measurement and identification of cheek muscle contractions. The utilization of both accelerometer and magnetometer is also prevalent. There are two distinct ways to classify the process: through the application of hardware and software. The hardware implementation is composed of three main components: headgear-mounted sensors such as flex sensors and accelerometers, a microcontroller that receives analog data from the sensors, and a connected computer where additional processing takes place. To create this model, software was implemented using both Java programming language and Arduino in an IDE environment. Assessment could be conducted by contrasting this particular prototype with hand-held input devices such as a mouse. On average, it takes about 2.5 seconds to move the cursor from one point to another on the screen and then click, whereas using a mouse takes approximately 1 second. Roughly 5% of clicks on this particular model are invalid or lack any response, whereas mouse devices typically have a flawless record with no erroneous clicks. According to the analysis, it has been found that the use of handsfree devices is not as effective as a physical mouse when it comes to controlling the cursor and executing cursor-related tasks. The practicality of this system can be enhanced by transforming it into a user-friendly device for individuals with physical disabilities. Additionally, its performance for screen operation can undoubtedly be improved. This technique currently focuses solely on controlling the cursor through head movements and cheek gestures; however, it has the potential to be extended to eye movements as well. [4]

Mohammad and et al, have proposed an algorithm that utilizes eye movements as a means of cursor control on a computer display. By accurately identifying the position of the eye and correlating it to an exact point on the electronic display. This model can be employed by anyone to manage the computer cursor's movements along the vertical and horizontal axes. Initially, the algorithm for detecting facial features identifies the position of the face on a captured image from a webcam, followed by recognizing the eyes within the frame. To expedite the processing time, focus on a single eye. Subsequently monitor the movement of the iris. The dark hue of the eye has the effect of diminishing the prominence of the image, consequently facilitating the identification of the area surrounding the iris. To pinpoint the location of the user interface cursor, the iris area is utilized by employing a shift mechanism. Using a MATLAB tool and a webcam, an image of the user's face is captured. The facial image is divided equally into three horizontal parts. The outermost layer that encompasses the eye is eliminated. First, the eyeball image is normalized to remove any background noise present in the image. Then, to enhance the contrast, the image is converted to a binary format. As the iris area appears black, the corresponding pixel values are either zero or close to zero, while the remaining area has a value of one. This particular model relies solely on data from a single eye, as focusing on one eye enhances its performance. However, this approach also results in lower accuracy as the model cannot take advantage of the other eye as a point of reference or to create a more comprehensive system. This system is currently designed for tracking eye movements exclusively, but it could potentially be expanded to also recognize and respond to facial movements and expressions. In addition, utilizing the entire second eye can enhance precision. [5]

IV. REQUIREMENTS

The tool that allows you to move the cursor on the screen by moving your eyes, mouth, or face is a complicated combination of electronic devices and computer programs. The system has a camera that takes pictures of the user's face and eyes when they move. You can put this camera wherever you want - on a monitor or on a separate stand. The information that is gathered is understood by a computer program that changes it into precise movements of the mouse on the screen. This computer program can be changed to fit how different people move their faces and eyes.

The system is comprised of a camera which is capable of tracking the eye and facial movements of the user. Additionally, there is a software program integrated within the system that is designed to interpret these movements, subsequently translating them into accurate cursor movements onto the computer screen. The camera's placement may vary according to the user's preferences and requirements, as it may be affixed onto the user's computer monitor or onto an independent stand. The software application can be adapted to accommodate variations in eye and facial movements among users, thereby facilitating the customization of the system to suit their individualized needs and requirements. In order to ensure optimum precision and promptness, the contemporary system employs machine learning algorithms and methodologies to decipher ocular and facial gestures and render them into exact cursor movements on the interface. The system is equipped with a suite of capabilities, including mouse clicks, scrolling, and cursor control movements, that can be proficiently managed through precise facial movements and the act of blinking one's eyes to facilitate the clicking operation.

In order to operate the software within acceptable parameters, specific hardware preconditions must be met. These include the utilization of a more advanced Intel i5 core processor of the latest generation, at least 4GB of RAM capacity, and a minimum internal storage capacity of 64GB. Moreover, the configuration must include an internal Intel graphics processing unit, a web camera or an external camera equipped with a resolution higher than or equal to 1920x1082, and a monitor featuring a resolution surpassing 1024x768. The establishment of specific requirements is crucial for ensuring the seamless and effective operation of the software, thus facilitating the precise monitoring of eye and facial movements in order to manipulate the mouse cursor. The fulfilment of these requirements is advised in order to guarantee the adequate functioning of the software.

The system's software requirements involve the utilization of Python programming, which constitutes the platform employed for modelling purposes. The integration of Artificial Intelligence and Machine Learning algorithms, coupled with Digital Image Processing techniques, is imperative to effectively execute the system and achieve real-time video rendering. The system necessitates the utilization of a Windows 8 operating system version or higher. Moreover, the robust operation of the system necessitates the installation of several Python libraries, including but not limited to OpenCV, NumPy, Scikit-Learn, dlib, and pyautogui, on the computing infrastructure.

This system uses eye, mouth, and face movements to control the cursor on a computer, and it is made up of advanced hardware and software. The system uses different parts like computer parts and instructions, and special programs to watch how your face and eyes move. This helps make it easier to move the mouse on the computer screen. Python programming, Artificial Intelligence, and Digital Image Processing techniques are used to create a system that can track and interpret facial and eye movements in real-time. This allows the system to accurately control a cursor. The rules for the system might seem tough, but they are really important for the software to work well with the hardware.

V. MODULES

Upon initialization of the model, it is feasible to delineate the principal functional prerequisites into multiple stages. Alternatively, the model may be illustrated based on the foundation of the functional requisites.

1. IMAGE PROCUREMENT

This technology uses webcams to track and record your face and eye movements. Video technology helps the computer see and save movements, then uses special rules to make what we want. The computer does not save a video of what the user does. It saves pictures instead. The video is divided into smaller parts called frames. This happens every few seconds or milliseconds. The computer looks at each picture separately and checks for any movements in the face or eyes that are important.

There can be a lot of pictures if the camera takes lots of pictures quickly or for a long time. This is difficult for the computer because it has to be really good at sorting the information quickly and correctly. To solve this problem, the computer was taught with lots of pictures that have both people's eyes and facial features. This information helps the computer know

how to identify when someone is blinking or raising their eyebrows.
The training process teaches the computer by showing it many pictures and telling it what each picture is supposed to look like. This helps the computer understand how to change its settings based on the picture you give it. After the training is done, the model can be used to quickly detect and respond to specific facial and eye movements in real life situations.

2. IMAGE RECOGNITION

After taking a picture with the webcam, the next thing we do is figure out what kind of thing we took a picture of. The computer program needs to be able to identify and sort out the way a user's face and eyes move, so that the user can control the cursor on the screen by moving their face and eyes. The webcam takes pictures with a lot of information, like where your eyes and face are located. It can also tell when you make different faces, move, or look in different directions because everyone's face is different.
The model uses technology that recognizes the face and eyes of the user. Every picture taken is carefully looked at to see where the user's face and eyes are. This means breaking the video into small pictures either every second or every millisecond. Next, the model checks the frames to see how the user is moving their face and eyes.
The process of recognizing faces and eyes is complicated and uses different methods, like finding certain points on the face, identifying eyes, and following changes on the face. The model needs to correctly recognize the user's characteristics, even if they move or change over time. This is done using smart computer programs and learning methods.
When the model correctly identifies the features of the face and eyes, it sends this information to the next part of the system. The computer program controls the pointer on the screen by following the movements of the user's face and eyes. This means that you can control your computer by moving your face and eyes in easy ways, and the computer will react quickly and smoothly.

3. IMAGE MAPPING

The parts of the system's programming help find out where the image is so that the cursor can be controlled accurately. The way it works is that the process model can figure out and pinpoint certain parts of the user's face and eyes when it looks at an image. It does this with fancy computer methods and learning from previous examples. By ignoring unnecessary address details, the model can accurately figure out where someone's eyes and face are, which helps move a computer cursor very precisely.
The system figures out where the eyes and face are, and then tells the cursor to move the same way the person's face and eyes move. It means that moving the cursor around feels natural and easy, which makes using different computer programs easier and more enjoyable.
It's important to know that getting pictures and making maps happen right away. This means that the device can move the cursor smoothly and accurately based on the user's facial and eye movements. Furthermore, the system can understand and adjust to different facial movements, expressions, and eye positions for each person, giving a unique and adjustable experience to everyone who uses it.

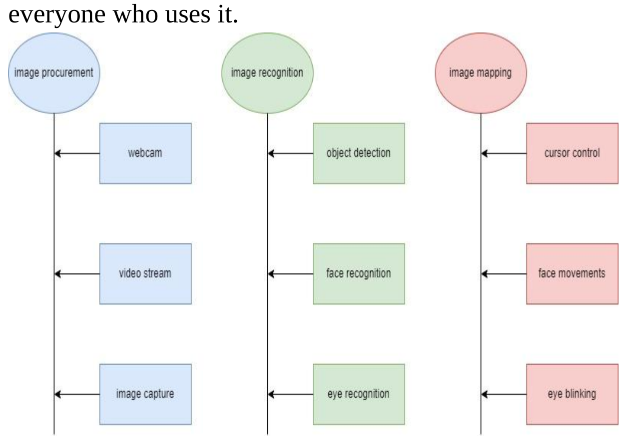

Figure 3 : Module Design

VI. IMPLEMENTATION

The functionality of the system is contingent upon the presence and operation of its core components: image procurement, image recognition, and image mapping. These constituents serve the critical purpose of precisely monitoring and analysing the user's ocular and physiognomic actions. The process of image procurement entails the attainment of high-frequency images of the individual's countenance and ocular organs by means of a camera or infrared sensor. The process of image recognition involves the utilization of machine learning algorithms to undertake a systematic analysis of the captured images, with an aim of identifying specific facial and ocular features of the subject. This includes a keen examination of details such as the shape of the eye, the position of the pupils, and the contours of the face. Subsequently, this data is utilized in the process of image mapping through the use of a mathematical model, accurately converting the spatial location and orientation of the user's eyes and facial features into a corresponding placement of the mouse cursor on the screen. Through exacting cartography of the user's ocular and facial movements to the cursor of the mouse, the system furnishes an intuitive and reactive interface geared toward individuals facing physical disabilities or injuries.

1. LIBRARIES

Python has many libraries that do different things such as math, automating tasks, and working with images. Many people use the NumPy library to handle big sets of data and do math. Matplotlib makes it easy to create pictures that can be moved around and ones that stay still. This makes Python very useful for science, figuring out data, and machine learning.

The OpenCV software helps to work on images and videos easily. It is very useful in many fields such as science, transportation, safety, and education. Dlib has useful tools to help computers see and understand pictures better. This includes things like knowing where a face or important parts of a picture are. Moreover, its various uses have caused many people to use it in many different ways for many different things.

The imutils tool helps people who use Python to work with pictures or videos of faces. The face_utils part of the tool makes it easier to adjust and change specific parts of the face. Pyautogui software helps automate tasks on a computer so users can save time and energy. The time library helps with managing time and date easily and can be used in many different situations.

2. FUNCTIONS

Facial landmark detection is an important idea used in computer vision and image processing. This means finding certain spots on someone's face and using math to figure out different things about their face. Euclidean distance is a way to measure things that is very important for finding facial landmarks. This is a way to measure how far apart two points are in a space with many dimensions. When trying to find certain parts of a face, like the eyes or lips, we can use a math formula called the Euclidean distance to figure out how far apart they are.

The Eye Aspect Ratio (EAR) is a way of measuring how the eyes look in a picture or video. The EAR function is when you measure the distance between the top and bottom of the eye compared to the distance between the corners of the eye. This test can tell if a driver has closed their eyes or almost closed them. This shows if they might be getting sleepy and might have a higher chance of falling asleep while driving. The EAR is useful in eye tracking and detecting things. Mouth Aspect Ratio (MAR) is a measure used in technology that finds important points on a face to see how wide a person's mouth opens. The MAR function uses the distance between landmarks on the lips to figure out how far apart the corners of the mouth are. The MAR value is bigger when your mouth is open and smaller when it's closed. This tool is used for different things like understanding what people are saying, detecting emotions, and recognizing when someone is smiling in a picture of their face.

To find out which way someone's face is pointing, we use a formula that measures the angle between their nose and a circle in the middle. This tool calculates the angle between a line connecting your nose tip and a reference circle's center, and a horizontal line crossing through the reference circle's center. The calculation is based on aligning your nose tip precisely with the center of the reference circle. The angle can tell you how someone is tilting their head or facing the camera or objects around them. This is a helpful tool for recognizing faces, virtual reality games, and robots. It helps keep track of the position of the head or face accurately and consistently.

3. FACIAL LANDMARKS

Facial landmark detection is important for computers to recognize specific parts of a face, and it can be very useful in different areas of technology. To get accurate results, we need good pictures or video of a person's face when using landmark detection algorithms. We normally use special programs called Haar cascades and deep learning models to spot different parts of people's faces. Various computer programs can find specific points on a person's face. One of these methods is called the Eye Aspect Ratio (EAR), which helps find landmarks on the eyes. To make it easier to handle lots of information, people change the colors and size of pictures.

Turning a picture into black and white can make it easier to see details, especially in a person's face. It makes the picture simpler and helps you notice certain features better. Histogram equalization is a method of dividing an image into sections and then fixing the distribution of the colors in each section. This makes it easier to find and identify facial features in the image. Noise reduction filters can help avoid problems in image quality caused by noise.

We use these methods to make the pictures smaller and easier to handle. Finding important points on faces needs a lot of computer power which can make things slow. By using these techniques, we can make pictures or frames used for finding facial landmarks better, which leads to more correct and dependable results.

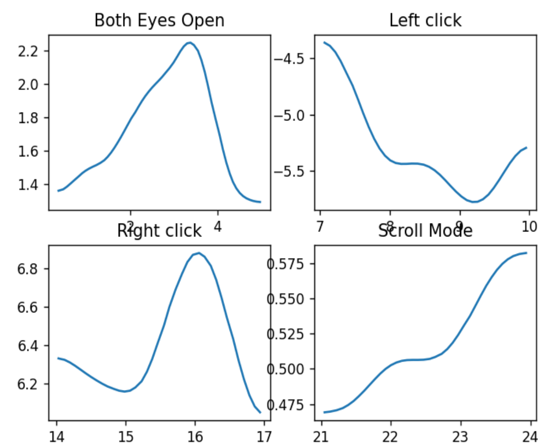

Figure 4 : values obtained by smoothing using gaussian filter

4. CALIBRATION

The calibration mode plays a pivotal role in facilitating the precise monitoring of the user's ocular and facial behaviour, thereby allowing for the accurate translation of these movements into corresponding cursor movements. The imperative task of archiving crucial data for future retrieval necessitates the utilization of appropriate storage techniques. In this regard, the use of NumPy arrays is deemed a viable solution. In the calibration mode, the participant directs their gaze towards pre-determined targets, while the system captures and records their ocular and cranial movements. Subsequently, the data pertaining to calibration is recorded and systematically organized into a two-dimensional array using the NumPy framework. This array is capable of facilitating instantaneous adjustments to the tracking algorithms.

Accomplishing meticulous and reliable manipulation of the mouse cursor is guaranteed, and the stored calibration data can be employed to improve the accuracy and validity of the system over an extended period of time. Furthermore, NumPy arrays have the capability to accommodate ancillary data linked to the surveillance of ocular and facial movements. This attribute offers the possibility of enhancing the entire user encounter. The inclusion of the calibration mode and the adoption of NumPy arrays for the retention of calibration data constitute fundamental elements of assistive technologies, which are an essential contributing factor in enhancing the user's experience, particularly for individuals with disabilities or challenges in operating standard mouse and keyboard inputs.

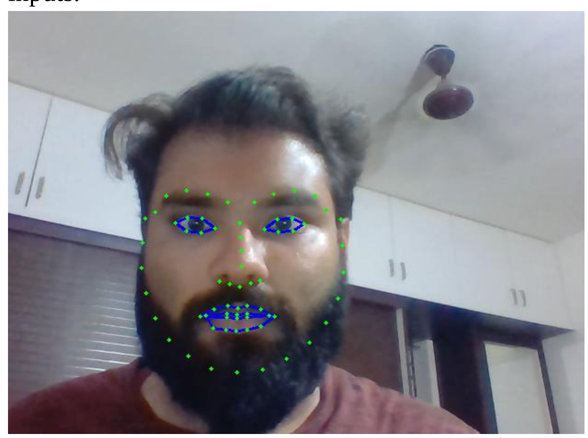

Figure 4 : Calibration Mode for and reading facial landmarks

5. MAPPING

Pyautogui is a tool that helps track the movements of the face and eyes. This tool watches how your eyes move and your face looks using a computer. The system can find out if a person's eyes are open or closed by looking at where their eyes and mouth are. Then, it can use this information to move the computer mouse on the screen. The Pyautogui tool can make the computer think the user is clicking and scrolling the mouse like they usually do.

We use a special method to make sure our results are correct. This method removes any extra, unimportant information from the data we use. This program looks at where the person is looking and uses a way to decide if they want to click on the left or right side of the computer. The EARdiff tool figures out how different the shapes of a person's eyes are, which tells us how much they are closed or open. The decision is made better by looking at how big the eye area is. This way of using the mouse cursor lets you move it in a more natural way that matches how you move your eyes and face.

Pyautogui and smoothing algorithm make it easy to move the mouse cursor without actually touching the mouse. It is a seamless and quick process. This can be really helpful for people who have trouble moving around, because they might find it hard to use typical computer mouse tools. Eye and face tracking technology helps people use their computer by relying on the movements they use in their everyday life. This makes it easier and more natural to navigate and interact with the computer.

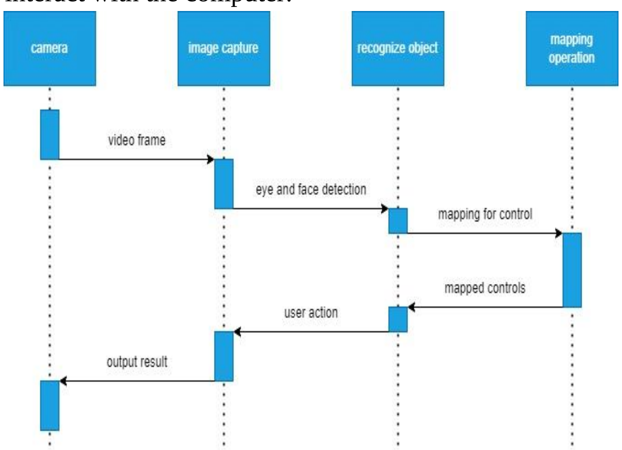

Figure 5 : Sequence Diagram

An efficientmanner Locker Security System Using Facial Recognition and One Time PasswordT

VII. CONCLUSION

To sum up, this tracking technology is a really new and important invention that helps humans work better with computers. Moving the computer mouse with your face and eyes is easy and feels like a normal way to use the computer. This technology can help people who have trouble moving their hands use the computer in a different way. The technology improved because computers can now recognize and learn about faces and eyes very well. This helps find and monitor certain features in them very accurately. But using this technology can have problems. For example, it might not work well when it's too dark or there's a lot of noise around. Sometimes, it can be hard for people to keep their eyes and face in the right place for the tracking to work well. Although there are difficulties, moving the mouse cursor with eye, mouth, and face tracking technology is getting ready to change the way people work with computers. As technology gets better, we can expect to see easier and smarter ways of using computer vision and machine learning. This technology can help more people use computers easily. It will include more people in the digital world.

REFERENCE

[1] Pavithra, Rakshitha, Ramya, Vikas Reddy, “Cursor movement control using eyes and facial movements for physically challenged people”, International Research Journal of Engineering and Technology (IRJET), IEEE, 2021.

[2] Kshitij Meena, Manish Kumar, Mohit Jangra, dept. of computer science and engineering, “Controlling mouse motions using eye tracking using computer vision”, Delhi Technological University, IEEE, 2020.

[3] Sharon Mathew, Sreeshma A, Theresa Anita Jaison, Varsha Pradeep, S Santhi Jabarani, dept. of ECE, “Eye movement-based cursor control and home automation for disabled people”, RSET, IEEE, 2019.

[4] Kushal Sancheti, Sridhar Krishnan K, Suhas A, Suresh P, Dept. of ECE, “Hands-free cursor control using intuitive head movements and cheek muscle twitches”, PES university, Bengaluru, IEEE, 2018.

[5] Mohamed Nasor, Mujeeb Rahman K K, Maryam Mohamed Zubair, Haya Ansari, Farida Mohamed, “Eye-controlled mouse cursor for physically disabled individual”, Dept. of Biomedical Engineering, Ajman University, 2018.