Cursor Control Using Eyes and Face Tracking

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Abstract **– The description of this system presents a hands-free interaction between human and computer. The mouse which is typically used by people has been replaced in a new way which uses the human eye and facial expressions and features. It employs a number of image-processing techniques, including face detection, eye extraction, and real-time interpretation of an eye blink sequence, to control a non-intrusive human computer interface. Human eye movements are used instead of a mouse to interact with a computer. It uses a typical webcam to capture an input image.**

Key Words: **Human Computer Interaction(HCI), facial-recognition, eye-movements.**

1. INTRODUCTION

The possibility of computer interaction with humans in a more natural or direct way compared to using a mediator like hand held input devices, keyboard and mouse has been a long speculation. the computer has to put up with human's natural sensing and perceptual behaviours. The computer has to track human body movements through video as an input, this technology is often referred to as perceptual user interface or human computer interaction.

By capturing the movements of human motion through video input devices like camera which are locked to the computer, the mouse movements can be controlled by the human motion. The face has received the most research attention among human body parts for visual human tracking and human computer interaction. People have suggested using mouth, nose, and even eye movements to control a mouse.

The main objective here is to introduce a camera driven by visual eye and face movement tracking for achieving hands free control cursor control. Human computer interaction becomes feasible solution over the handheld devices. The movements of our mouths, eyes, and faces can be divided into rigid movements like rotation and translation and non-rigid movements like opening and closing.

By developing visual and eye tracking system, we can be able to retrieve accurate and detailed motion parameters at real time. The orientation and translation can be navigated to movements of mouse cursor and, detection or subtle changes be navigated to triggering of mouse events

Not every person in this world can be able to use physical handheld input devices like mouse and keyboard, because some people may be differently abled individual, physically abled individual, autistic individual and so on. These handheld input devices will be very difficult for them if they wish to communicate with the computer. So, the best alternative for these people is to directly communicate with the computer using their own face and eye movements. Their face and eye movements can be very helpful for them to directly communicate with their computer.

Their face and eye tracking can be achieved through the camera mounted on a computer and these cameras are primarily important to perform human computer interaction. These camera's track their face and eye movement and their movements will be mapped to the movement and trigger of the cursor. So, their action will be similar to what others perform using handheld mouse device.

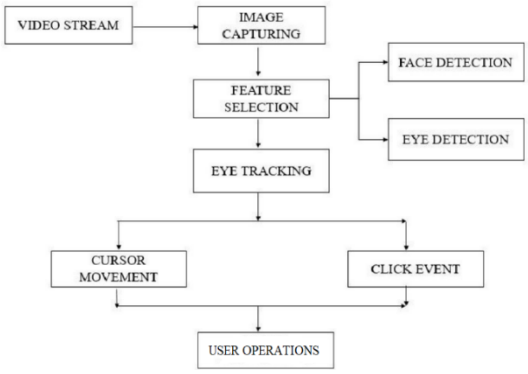

Figure: Initial Design Phase

From this basic 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 and eye for the operation. If the user wants to go for eye movements, the system will recognize eye detection and if the user wants to go for face movements, then the system will recognize face detection through the motion of face and eye. Suppose if the user chooses for eye motion for their operation, the system will track the movements and map those eye movements to the movement of computer cursor 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.

2.LITERATURE SURVEY

Pavithra and et al, have proposed a hand-free interface between human and computer. The mouse which used by people has been replaced by the human facial expressions and features. For operating the human computer interface, it makes use of techniques for image processing like face detection, eye extraction, and real-time interpretation of an eye blink sequence. Primarily the webcam is used and starts capturing the images in video. Then the process begins and starts extracting all frames from the captured video, the framerate will be of 30fps. Each frame goes through a set of processes and then plotted to the cursor and thus this process occurs as a loop. The region of the face is being detected by using facial landmarks such as eyebrow ends, eyes, mouth ends, nose, jaw line. It is successfully applied to alignment of face, estimation of head pose, face swapping, detection of blink and many more. Then it recognizes the eye region and pinpoint the location of the eye and classify in which direction the eye movement is moving and in which position if the cursor is moving through the movement of eyes. The processing of accurate details of user interface requires high computational models and designs, which might be expensive to purchase these systems, without a proper a webcam the system will not be able to recognize the user's facial expression and eye movements to classify and control. This system can be able made flexible to any changes and also in terms of improving performance of the model as well, not only with face and eye to control the mouse cursor but also with other body parts such as hands and finger movements can be made to enhance the system capabilities. [1]

Manish and et al, have proposed an algorithm to provide a hands-free means of communication between people and computers. Using computer vision, extract various human facial expressions, map them to previously stored expressions, and then carry out the appropriate actions. allowing for left and right mouse clicks, up and down scrolling, and left, right, up, and down cursor movement. A person's face is first detected using the face detection algorithm, and the position of their eyes and lips is then determined in order to control mouse actions like left- and right-clicking and cursor movements. The camera keeps on looking for a face to capture the image at 30 fps, when it detects a face, it then checks if the face control function is on or off. Then it enables the face control function for different instructions as per the direction of the face given. If the user wants to scroll up and down the page, the user can move their head up and down. Therefore, here all user needs to do to move the pointer is to turn his head. An extra activity implemented here is, every time if we want to activate this cursor control, we need to open and close our mouth and also the same for deactivation. Also same goes for scrolling as well where user needs to squint their eyes for activation and deactivation which takes up an extra process. This system can be made adaptable to any types of computers irrespective of what web camera the other user use and what facial and eye properties the other users possess. [2]

Sharon and et al, have put up the concept of using an eye tracking system for acquiring eye movements to control the computer mouse pointer for persons who are limited to using only their eyes to move. Detection of eyes in the image and extracting eye coordinates from facial landmark detection. Convert the RGB image to GRAY image to avoid anything unnecessary. Get the eyes as an array of values. Change the array's values to track the eye movements. Map the array values to the cursor coordinates after comparing the newly obtained array with the initial array. The facial landmark detector which is used to detect the eye and its movement consist of pre-trained models. The dlib package is used in Python to estimate the locations of all the coordinates that map the facial points on a

person's face. The pre-trained facial landmark detector is included in the dlib library. The result is a vector of rectangles that contains one or more faces in the original image and the detected face rectangles. As this model automates almost all the home appliances using some hardware devices, implementation of the model will take its time and also to buy certain electronic components which can be quite expensive. Automating all the device necessary can also impact in its performance and quickly degrade as well. This model can be improved to recognise emotions and display a message meant to lift the user's spirits. In order to set an alarm for safety purposes, it can also be used to detect the user's tiredness. [3]

Kushal and et al, have proposed a proof for Human-Computer Interaction (HCI). The headpiece in this prototype uses two separate signals. One is a natural head movement to move the cursor, and the other is a twitch of the cheek muscles to click the pointer. Flex sensors are used to measure head movements and detect twitches in the cheek muscles. Accelerometer and magnetometer are also used. The process can be categorized into hardware and software implementation. Hardware implementation mainly consist of three units, sensors which are installed in headgear like flex sensors and accelerometer, Microcontroller which takes the sensors data as analog input, and a computer where the microcontroller is connected where further operations are performed. Software implementation where development takes place in java program and Arduino which is in an IDE platform to perform further operations for this model. : Evaluation can be made on the basis of comparison between this model and handheld input device like mouse. Average time taken to move the cursor form one point to point on screen and then perform a click is about 2.5 seconds compared to about 1 second using mouse. The percentage of false click (no click produced) on this model is about 5% compared to 0% or no negative clicks at all in mouse device. Thus, from analysis we can come to know that the operations performed on handsfree device is less viable compared to physical devices like mouse in terms of control of cursor and operations performed on cursor. This system can be made more viable to use as a user-friendly device to physically challenged people and can definitely be made to be more efficient in performance for screen operation. This is limited is to only head movement and cheek gestures but can also be implemented for the eye movement as well to control the cursor [4]

Mohammad and et al, have proposed an algorithm for using eye movements to control the cursor on a computer screen. by locating the eye's location and mapping it to a precise location on the computer screen. Any person can utilize this model to control the computer cursor's movement in the left, right, up, and down axes. Firstly, the face detection algorithm locates the face on an image frame captured by a web camera, next to detect the eyes from the frame. For faster processing time consider only 1 eye. Then track the iris movement. Due to the black colour of the eye, the image is less prominent than the rest of the eye, thereby making it easier to identify the iris region. The cursor point on the user interface is then mapped by using shift in the iris area. With the support of a webcam and a MATLAB tool, the user's face is captured as an image. The face image is separated horizontally into three equal sections. The top layer containing the eye is removed. The background noise is then eliminated from the eyeball image by normalising it, and the contrast is then improved by transforming it to a binary image. Since iris region is black, the pixel values will be zero or near to zero and the other region will be 1. This model uses only or extract information only on one eye and the other eye is neglected, because the performance of the model will increase, but the accuracy of the model is less efficient as we are not using other eye either as a reference point or to use the system as a whole. This system is made operable only for eye movements, this system can further be developed to be operable on facial movements and expressions as well. Also, the accuracy can also be increased by making use of the other eye as a whole as well. [5]

An efficient manner Locker Security System Using Facial Recognition and One Time Password

3.CONCLUSION

By putting this procedure into practise, we can draw the conclusion that the cursor can be moved without the need of hands by changing face expressions and eye movements. For those who are incapacitated or have lost limbs, being able to control the cursor with their eyes alone instead of needing a partner is helpful. This technology can be improved in the future by creating, changing, or developing other approaches

such clicking events and human computer interfaces that employ eye movement and blinking to control the cursor. Technology advanced to include this eye tracking method to obtain the precise and effective movement.

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