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Human Computer Interaction Based Head Controlled Mouse

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ABSTRACT:

Hand-free control for human-computer interface has been very important nowadays. For hand-free solution, to use human body movement tracking in video input and utilize the tracking is an important kind of solution. In this paper, we have presented a hand-free head mouse control based on mouth tracking. We use mouth position interval information between front-frame and the next-frame in video frames of head motion to confirm if a mouth tracking is movement information or command information, once a movement information has been determined, we use a mapping function which is set up by relationship between MMA and screen to map mouth position, then the real mouse position can be got, by this way we can operate mouse cursor in OS. On the other ways, if mouse click command information is determined, we can capture the mouth movement tracking, and then use recognition machine to recognize the tracking to determine which command it is. We have made experiments on Windows System to evaluate that our algorithm can represent a good effect for human-computer interface.

Keywords: Eyes, human head,opencv, Mouse,Deep Learning.

INTRODUCTION

With the proceeding of computer science and technology, the usage of computer has brought about significant facilitation in every aspect of the society. However, the common computer input devices are usually designed for normal capable users, instead of elderly and disabled ones. The use of computers requires a mouse, a touchpad, a keyboard or other external devices. Users with upper limbs disabilities are incapable of controlling the mouse or keyboard easily, which makes it extremely difficult for them to use a computer. For common computer users, the long-term usage of conventional input devices causes chronic sore in hands, shoulders or neck, and greatly increases the risk of getting cervical or vertebral spondylosis.

In order to facilitate the disabled to use computers, extensive work has been carried out and two kinds of solutions are presented. The first solution is to use contact-type auxiliary equipment, e.g. infrared sensors and infrared reflector, to detect the user's movements to control a computer. Takami et al. invented a special kind of eyeglasses with three light-emitting diodes. By sitting in front of a computer with the eyeglasses, the user's image will be captured by camera, and the head movements are judged, so as to operate the computer. Evans et al. used infrared light-emitting diodes and photo detectors as auxiliary equipment to determine the user's head position to operate a computer. Chen et al. produced a mouse and a keyboard which can detect infrared signals. These devices use infrared light to achieve positioning and determining whether it is clicked or not, realizing operations of

mouse and keyboard by head. Judging eyes gazing direction by measuring the corneal reflex can also be used to operate the computer. Gips et al. used EOG (electrooculographic potential) to detect eyes movements. They designed an EOG-based system that allowed people to control a mouse through moving eyes. The results of such research have been applied in the lives of children. The advantage of contact-type solution is that the detection of movement is accurate. However, the solution requires the user to wear special glasses, sensors or other equipments, which brings inconvenience to the user. The cost of these auxiliary devices is very high which greatly limits their wide usage.

The second solution is non-contact-type, which is to determine the user's action by collecting and analyzing the user's facial images with image processing techniques. Masoomeh and Alireza proposed an algorithm to transfer 2D camera motion information into 3D information to realize mouse operations. Margrit et al. realized mouse operations by tracking the facial features and achieved certain effects. Some other systems detected and analyzed the movement of eyes or mouth to operate the mouse. Compared with the contact-type method, non-contact-type method is easy to use, free of any contacting devices, and with better experience of users. However, this method requires high-quality camera and image processing equipment. The software that suits this system is yet to be perfected until now.

The paper proposed an algorithm to detect the movements of head and mouth and made a simple demo verification. In this paper, we presented a complete head-trace mouse system via webcam, using image processing technology to recognize the movements of head and mouth. Besides, we made a detailed introduction for the functions of the head-trace mouse.

Head Tracking Virtual Mouse is an application that uses the feature classification method to map the mouse pointer on the screen to the movements of head and eye in frames through a camera. The system analyzes the relationship between different combinations of the detected head and eye open and closing action, and then maps them to mouse events on the computer system. Our aim is to use this application mainly for the upper limb disabled who are unable to use the traditional mouse.

LITERARY SURVEY

A survey on head based Human Computer Interaction which centers highlights, for example, head following, face and look acknowledgment, eye following, and motion acknowledgment HCI is introduced by Porta (2002) and Turk (2004). Versatile and canny HCI is examined by Duric et al. (2002) with a survey of PC head for human movement investigation and a conversation of strategies for lower arm development location, face handling, and look examination. These articles concur that coming the effortlessness of human connection assumes a focal part in store for HCI and that this goal can be drawn closer by planning versatile HCI frameworks that are emotional, setting mindful and multimodal.

As indicated by Reeves et al. (2004), a multimodal HCI can be a powerful means for lessening vulnerability of single-modularly detected information, (for example, discourse or hand movement), in this way further developing heartiness. Albeit, the fuse of all elements of human connection into human-PC cooperation might be extremely complicated and hard to accomplish, furnishing HCI frameworks with a multimodal arrangement so they can move toward effortlessness, adaptability and power of human correspondence will give them the possibility to rise above the customary, bulky and unbending mouse/console communication, and yield a more viable and productive data and order stream between the client and the PC framework.

Understanding the circumstance of a human through head examination is one of the center advances in natural HCI strategies. In a perfect world, we would like the PC to comprehend the client similarly that another human would, essentially through visual symbolism. We are chipping away at the key study of outwardly understanding people through extricating data naturally about the face, looks and hand signals.

The point of this study is to accentuation on shrewd collaboration among Human and PC utilizing PC vision. Our expectation is that in

the following ten years the exploration local area will took huge steps in the study of human-PC connection and that new
ideal models will arise which will bring about regular association between people, PCs and the climate.
Out of all the correspondence channels through which data can travel, vision gives a ton of data that can be utilized for the acknowledgment of human activities and signals which can be dissected and applied to communication purposes (Turk and Kolsch, 2004). Explicitly while sitting before a PC heads and faces can be thought to be noticeable to a webcam, an exceptionally normal info gadget these days. Consequently, it is normal to consider a point of interaction in light of head developments, face motions or looks.

Architecture

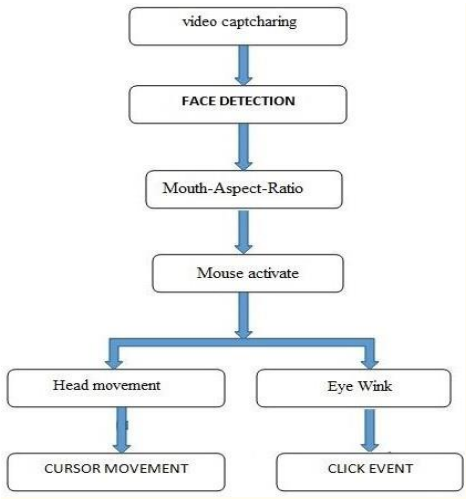


Fig. Architecture diagram

EXISTING SYSTEM:

A dream based human- - PC connection point is introduced in the paper. The point of interaction distinguishes intentional eye-squints and deciphers them as control orders. The utilized picture handling techniques incorporate Haar-like elements for programmed face location, and layout matching based eye following and eye-squint discovery. Interface execution was tried by 49 clients (of which 12 were with actual inabilities). Test results show interface helpfulness in offering an elective mean of correspondence with PCs. The clients entered English and Polish text (with normal season of under 12s per character) and had the option to peruse the Internet. The connection point depends on a scratch pad outfitted with a common web camera and requires no additional light sources. The point of interaction application is accessible on-line as open-source programming.

The past frameworks utilized complex calculations. They depended on the biometric recognizable proof procedures. Some expected to mount gadgets on the client like Lasers which was not practical. Subsequently, our point is to devise an application that will be savvy and not be subject to the biometrics but rather on the element arrangements of the client. It ought to utilize less equipment and less difficult calculations. The goal is to utilize such a framework that will help the upper appendage crippled who can't utilize the conventional mouse or console.
Inconveniences of Existing System:
The current framework is restricted to the biometric recognizable proof. To upgrade this, we have utilized the component arrangement strategy.
There are sure issues in existing framework as follows:

Mounting gadgets: These frameworks required a mounted gadget like lasers or cameras on the client which became dreary. Biometric distinguishing proof: The framework involved biometric ID for which the clients needed to enroll themselves prior to utilizing the framework. It wasn‟t open for all which has been redressed by the proposed application. Complex calculations: The past frameworks utilized numerous mind boggling calculations that required a ton of computations to be finished relying upon different markers.

PROPOSED SYSTEM:

Patients with no or restricted hand capability for the most part experience issues in utilizing traditional info gadgets, for example, a mouse or a touch screen. Having the capacity of controlling electronic gadgets can give patients full admittance to the computerized world, consequently expanding their freedom and certainty, and

advancing their lives. In this review, a sans hands human-PC connection point was created to assist patients with controlling PCs utilizing facial developments. Five facial development designs were identified by four electromyography (EMG) sensors, and ordered utilizing myoelectric design acknowledgment calculations.

Facial development designs were planned to cursor activities remembering developments for various headings and snap. A composing task and a drawing task were planned to evaluate the collaboration execution of the connection point in day to day use. Ten physically fit subjects partook in the examination. In the composing task, the middle way productivity was 80.4%, and the middle info rate was 5.9 letters each moment. In the drawing task, the middle chance to achieve was 239.9 s. The connection point driven by facial EMG accomplished superior execution, and will be surveyed on patients with restricted hand capabilities later on.

Calculation introduced in this task performs tasks profoundly fixated on foreseeing the EYElandmarks of a given face. We can get a great deal of things done utilizing these milestones. The applications, results and conceivable outcomes of EYElandmarks are massive and fascinating. Dlib's prebuilt model, which is basically an execution of besides the fact that a quick facedetection yet in addition permits us to precisely foresee 68 2D EYElandmarks. Extremely convenient utilizing these anticipated milestones of the face, we can construct fitting elements that will additionally permit us to recognize specific activities, such as utilizing the eye-aspectratio to identify a squint or a wink, utilizing the mouthaspect-proportion to distinguish a yawn and so forth or perhaps a mope. In this task, these activities are modified as triggers to control the mouse cursor.

PyAutoGUI library was utilized to control the mouse cursor. For face identification, an AI based approach is utilized, Object discovery calculation proposed in. This procedure utilizes a Haar-highlights based approach for object identification, which makes the fast and precise item location conceivable. We characterized five movements as the premise of head developments, specifically, standard head, head left, head right, head up, and head down, the face which addresses the distinguished head (the head In this undertaking alludes to front region of the face), and shutting of the eye plays out the chose choice of left click, right snap.

Benefits:
1.Quick reaction time
2.Customized handling
3.Small memory factor
4.Really supportive for handicapped individuals

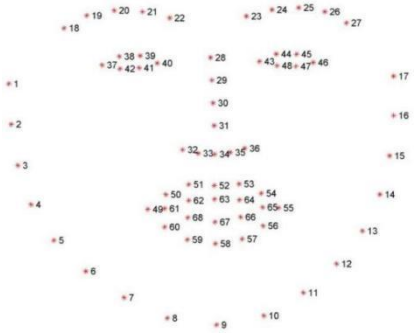
IMPLEMENTATION:

The objective of execution is to make a code which is not difficult to peruse and comprehend. This is the most essential stage in procuring productive programming or a system and giving the client positively that the new programming or the structure is practical and gives convincing results. The source code should be clear with the end goal that the investigating, testing, adjustments can undoubtedly finished. As they consume a huge piece of programming spending plans. In exact execution manages the nature of code, blunder expulsion and execution. This stage includes coding styles procedures, norms, and rules.

Calculation:

First the framework catches pictures by camera then recognizes the face region in the pictures. Let the beginning directions (0, 0) be at the upper left corner in the Figure. Furthermore, the flat and vertical direction are noted x and y individually. The direction values are determined in pixels. The square shape which approaches the face is the identified head region. We compute the mathematical focal point of the square shape, and name it as head focal directions, for example (Sx, Sy) .Then we can dissect the particular head development by time series relationship of the focal directions.
The calculation Head move for location of head developments is depicted as underneath
(1) Initialization:
Client sits up before the PC. Let the Head-Trace Mouse run. In the event that the head is recognized, the head signals in the initial 3 seconds are instated by factual strategies, and

afterward the head focal directions (Sx, Sy) of the standard head is determined.
(2) Set limit esteem:
Decide the limit esteem (Kx, Ky) in view of involvement.
(3) Judge the head developments:
Examine the pictures after introduction. The head focal directions of one picture is noted as (Cx, Cy). We analyze (Cx, Cy) with (Sx, Sy) to get the accompanying ends: If Cx - Sx> Kx, the judgment is that head moves left, abridged as left. If Cx - Sx < - Kx, right. If Cy - Sy < - Ky, up. If Cy - Sy> Ky, down. If | Cx - Sx | < Kx and | Cy - Sy | < Ky,standard head.
(4) Standard head migration: If the standard head has been identified in a few nonstop pictures, the typical worth of these head focal



directions will be determined as the new head focal directions (Sx, Sy) of the standard head.
(5) Go back to step (2) standard head picture caught by camera, where the external rectangular edges the identified standard head. the main issue (Sx, Sy) in the rectangular with strong lines, is the focal directions of the standard head. The strong lines outlines rectangular shows the area of head unmoving. Throughout framework activity, in the event that the head focal directions are inside this district, the head is pronounced as still. In the event that not, a related development is guaranteed. the U, L, D, R parts are the head development course, importance head climb, left, down, right, separately, as verified in sync (3) of Head move calculation

This undertaking is profoundly focused on foreseeing the EYElandmarks of a given face. We can get a great deal of things done utilizing these milestones. From identifying eye-squints [3] in a video to foreseeing feelings of the subject. The applications, results and conceivable outcomes of EYElandmarks are tremendous and charming. Dlib's prebuilt model, which is basically an execution of [4], not in the least does a quick face-identification yet in addition permits us to precisely foresee 68 2D EYElandmarks. Exceptionally helpful.

Utilizing these anticipated milestones of the face, we can fabricate fitting highlights that will additionally permit us to distinguish specific activities, such as utilizing the eye-perspective proportion (more on this beneath) to identify a squint or a wink, utilizing the mouth-viewpoint proportion to recognize a yawn and so on or perhaps a frown. In this undertaking, these activities are modified as triggers to control the mouse cursor. PyAutoGUI library was utilized to control the mouse cursor

10.2 Eye-Aspect-Ratio (EAR)
You will see that Eye-Aspect-Ratio [1] is the least complex and the most exquisite component that exploits the EYElandmarks. EAR helps us in distinguishing squints and winks and so forth.

You can see that the EAR esteem drops at whatever point the eye closes. We can prepare a straightforward

classifier to recognize the drop. In any case, an ordinary on the off chance that condition turns out great. Something like this:
if EAR <= SOME_THRESHOLD:
EYE_STATUS = 'CLOSE'

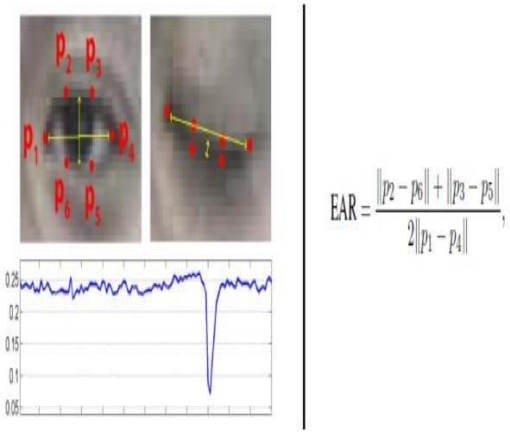


Fig. Eye Detection Using OpenCV

This appears to be complicated from the start yet it is extremely simple. Allow me to walk you through the whole cycle and you will feel something similar.

Stage 1: Considering our essentials, we will require a picture, in the first place. Later we really want to make an outpouring classifier which will ultimately provide us with the highlights of the face.
Stage 2: This step includes utilizing OpenCV which will peruse the picture and the elements document. So as of now, there are NumPy clusters at the essential data of interest. All we really want to do is to look for the line and segment upsides of the face NumPyN layered exhibit. This is the exhibit with the face square shape facilitates.
Stage 3: This last step includes showing the picture with the rectangular face box. Screen shots

To run this undertaking double tap on „run.bat‟ document to get beneath webcam screen

In the screen you can see cursor moves in view of eye ball development. Special case will raise and window close assuming u move cursor close corners of the screen

RESULT:

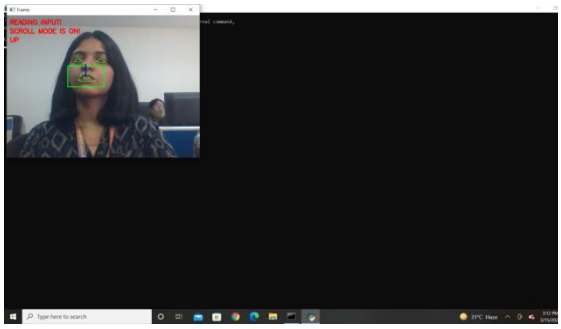


Fig. UP Movement

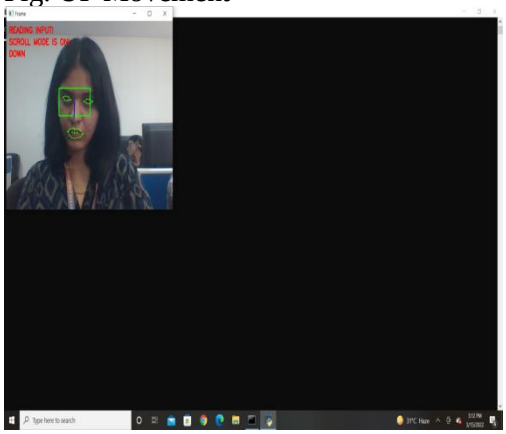


Fig.Down Movement

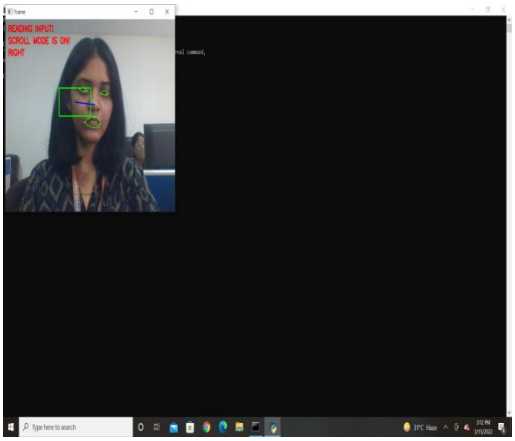


Fig.Right Movement

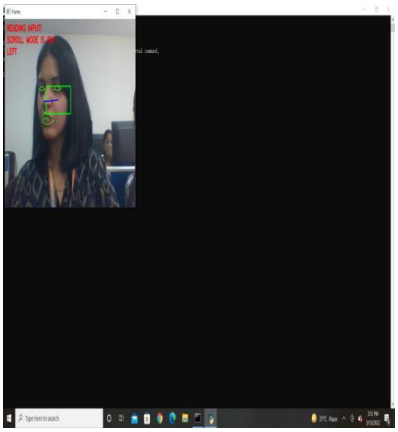


Fig.Left Movement

CONCLUSION AND FUTURE SCOPE:

This paper presented the standards of a PC human cooperation framework in view of continuous state-location of head and mouth. Also, the head-follow mouse framework was planned and carried out. It was demonstrated that this framework was fit for playing out most of a customary mouse's tasks. With this framework, clients can work PCs by their head and mouth developments before web cameras. This framework has been tried by a broad number of people and has been generally perceived. The business results of this framework have been created.

We have carried out a framework to get to the mouse pointer on the PC screen utilizing just EYEfeatures. With the utilization of a camera and python innovation, the framework engineering is ready. Client can

see head and eye developments caught through the camera which is shown on the screen, likewise the client can move the mouse pointer on a case by case basis and furthermore perform different mouse activities. The proposed framework is highlight based accordingly permitting any client to utilize the framework without earlier enrollment. This framework is particularly valuable for the upper appendage debilitated. At present, we are stretching out our execution to help console press innovation for the simplicity of the User to utilize the Keyboard hands free alongside the generally existing mouse developments given by the framework. This would then empower the User to get to the PC attributable to just EYEfeatures and developments without the utilization of customary mouse and console i.e Hands free framework

What's in store appears to be rich for head following HCI.The paper exhibit the different strategies utilized for execution of the combination of head point and discourse in genuine time.The required equipment and adjustment in the camera as per the prerequisite for the nose finding and restriction. Head following innovation additionally should be improved to build the legitimacy and dependability of the recorded information. Head global positioning frameworks need to become less expensive to make them a suitable convenience device for more modest business offices and examination labs.Once head following accomplish the upgrades in the innovation ,methodology,and cost it can eye tracker as an info gadget is quite flawed ,as in a mouse or console is,and that is caused both by the restrictions of current hardware and all the more critically by the idea of human head developments.

REFERENCES

[1] M. Betke, J. Gips, P. Fleming, "The Camera Mouse: visual following of body highlights to give PC admittance to individuals with extreme handicaps," Neural Systems and Rehabilitation Engineering, IEEE Transactions on , March 2002, vol.10, no.1, pp.1-10.

[2] R. Barea, L. Boquete, M. Mazo, E. Lopez, "Framework for helped portability utilizing eye developments in light of electrooculography," Neural Systems and Rehabilitation Engineering, IEEE Transactions on, Dec. 2002 , vol.10, no.4, pp.209-218.

[3] Y.L. Chen, "Utilization of slant sensors in human-PC mouse interface for individuals with handicaps," Neural Systems and Rehabilitation Engineering, IEEE Transactions, Sept. 2001, vol.9, no.3, pp.289-294.

[4] Q. Ji, Z.W. Zhu, P. Lan, "Ongoing nonintrusive observing and expectation of driver exhaustion," Vehicular Technology, IEEE Transactions, July 2004, vol.53, no.4, pp.1052-1068.

[5] Kenji Yamagishi, J. Hori, M. Miyakawa, "Advancement of EOG-Based Communication System Controlled by Eight-Directional Eye Movements," Engineering in Medicine and Biology Society, 2006. EMBS '06. 28th Annual International Conference of the IEEE, Aug. 30 2006-Sept. 3 2006, pp.2574-2577.

[6] C.H Morimoto, D Koons, An Amir, M Flickner, "Understudy recognition and following utilizing various light sources", Image and Vision Computing, 1 March 2000, vol.18, Issue 4, pp.331-335.

[7] S.W. Shih, J. Liu, "A clever way to deal with three dimensional look following utilizing sound system cameras," Systems, Man, and Cybernetics, Part B: Cybernetics, IEEE Transactions, Feb. 2004, vol.34, no.1, pp.234-245.

[8] A. Burns and M. Youthful, "Actual inabilities and registering innovations: an examination of hindrances". In The human-PC communication handbook, Julie A. Jacko and Andrew Sears (Eds.). L. Erlbaum Associates Inc., Hillsdale, NJ, USA, 2002, pp. 482-503.

[9] P. DiMattia, F. X. Curran, and J. Gips, "An Eye Control Teaching Device for Students Without Language Expressive Capacity EagleEyes," Lampeter, U.K.: Edwin Mellen, 2001.

[10] M. Nabati, A. Behrad, "Camera Mouse Implementation Using 3D Head PoseEstimation by Monocular Video Camera and 2D to 3D Point and Line Correspondences," 2010 fifth International Symposium on Telecommunications (IST'2010), 2010, pp.825-830.

[11] M. Betke, J. Gips, and P. Fleming, "The Camera Mouse: Visual Tracking of Body Features to Provide Computer Access for People With Severe Disabilities," IEEE Trans. on Neural Systems And Rehabilitation Engineering, March 2002, vol. 10, no. 1, pp. 1-10