COMPARATIVE STUDY OF HAAR AND ADABOOST ALGORITHMS FOR CURSOR CONTROL USING HEAD AND EYE MOVEMENT FOR DISABLES

[1]Anurag Singh, [2]Srishti Suvarna, [3]Vishnu Chettiyaar

[1,2,3]Smt. Indira Gandhi College of Engineering, Navi Mumbai, Maharashtra, India.

[1]anuragrameshsingh@gmail.com, [2]shreyaspatil301@gmail.com, [3]Vishnuchettiar1995@gmail.com

Abstract: Computer has influenced our life in such a way that it is very difficult to sustain without a computer. For physically challenged persons, especially persons without hands and legs, it is impossible to use the computers without an assistive technology. Keyboard and mouse are the most essential input devices to work with a computer. By the use of on-screen keyboard, a pointing input device such as mouse is sufficient to operate a computer with GUI software. The basic actions of a mouse are Mouse Movement and Mouse Button Click. This paper is on developing an assistive technology that replaces the mouse movement by head movement using OpenCV. The Mouse Button Click is implemented by any facial expression such as blinking eye, opening mouth and head movement.

Keywords: alternative mouse, assistive technology, hands free computing, gesture recognition, user interface, disabled users.

I. INTRODUCTION

Owing to the lack of appropriate input devices, people with disabilities often encounter several obstacles when using computers. Currently, keyboard and mouse are the most common input devices. Due to the increasing popularity of the Microsoft Windows interface, i.e., Windows 98 and NT, computer mouse has become even more important. Therefore, it is necessary to invent a simple mouse system for people with disabilities to operate their computers.

Existing system which uses eye wink and blink mechanisms to operate mouse does not work properly for the people who have problem of frequently eye blinking. Another problem is with system that uses only speech recognition mechanism for typing because it needs very clear pronunciations and knowledge of predefined command. No any existing system has done integration of virtual mouse along with virtual keyboard operated by both head motions and eye detection.

As accordingly to the previously invention mouse motion through eye blink was possible but the circumstances that occurred were the small blink or shorts blink were neglected. Even hardware was used for detecting eye blinks but it used to cause a eye damage. Our system uses only webcam for detecting face and eye movements.

Problem statement- Existing system which uses eye wink and blink mechanisms to operate mouse does not work properly for the people who have problem of frequently eye blinking.

Another problem is with system that uses only speech recognition mechanism for typing because it needs very clear pronunciations and knowledge of predefined command. No any existing system has done integration of virtual mouse along with virtual keyboard operated by both head motions and eye detection.

As accordingly to the previously invention mouse motion through eye blink was possible but the circumstances that occurred were the small blink or shorts blink were neglected. Even hardware was used for detecting eye blinks but it used

to cause a eye damage. Our system uses only webcam for detecting face and eye movements.

II. EXISTING SYSTEM

The existing system such that the interaction amongst the computer and human is carried out with eye-tracking and blink-detection. In this concept, human computer interface system exists which tracks the direction of the human eye. The particular motion and the direction of iris is employed to drive the interface by positioning the mouse cursor consequently. The location iris is completed in batch mode. Here the frames are stored in a permanent storage device and are retrieved one by one. Each of the frames is processed for finding the location of the iris position and there by placing the mouse cursor consequently. Such a system that detects the iris position from still images provides an alternate input modality to facilitate computer users with severe disabilities.

Also in head tracking system, the accuracy is reduced. And voice recognition is used instead of virtual keyboard. But the major drawback of voice recognition is that it needs very clear pronunciations and knowledge of predefined command. No any existing system has done integration of virtual mouse along with virtual keyboard operated by both head motions and speech recognition.

III. HAAR ALGORITHM

Algorithm for HEAD MOVEMENT-

(1)Estimation of Head Position and Motion

Proposed Method for Head Movement tracking is Haar cascade object detection method. Haar Cascade method is product of Voila-Jones implementation. Video processing is continuous framing of pixel values, where pixel is smallest unit of process. In proposed work every frame is searched for head position and we highlight this portion by rectangular box.

(2) Scaling

Based on the estimated object size in (length, width) by Haar detection we rescale the window size as ((length + width) /2). Then we determine scaling factor to set sensitivity of mouse motion on windows screen.

(3)Horizontal and Vertical Motion

The horizontal and vertical motion is calculated differently. In detection mode, the reference motion point is Rm = ((Wleft + Wright) / 2, (Wtop + Wbottom) / 2).

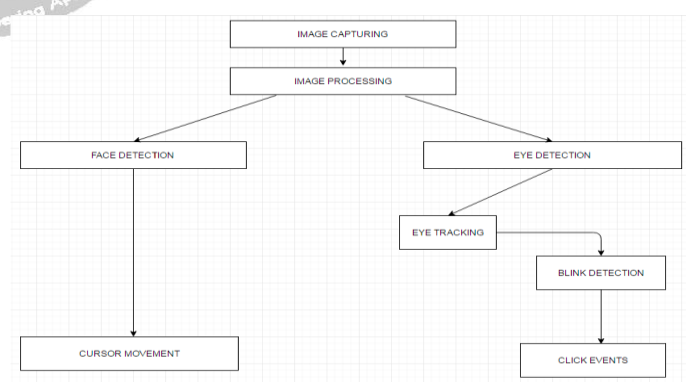
(4)Move Cursor in Large Scope

Mouse cursor moves according to the relative mapping between scend and processing windows screen motion. Relative cursor motion is multiple of factor of size of the tracking window. Normally it is six time the tracking window speed.

Proposed System- Our system is real time which captures a movement of mouse cursor through face detection and facial features.

It overcomes the existing system by avoiding the use of external hardware that caused serious eye damages. It uses a template matching method for eye extraction instead of using hardware, even as in previous system the short blinks of eyes were avoided or neglected.

In this system the hard blink is only used for selecting particular file or folder .With eye detection it's first aim is to captured face for the movement of mouse cursor. Then it reacts as the mouse does.



Adaboost Face Detection Algorithm-

HEADMOVE-

(1) Initialization: User sits up in front of the computer. Let the Head-Trace Mouse run. If the head is detected, the head signals in the first 3 seconds are initialized by statistical

ISSN : 2454-9150 Vol-02, Issue 12, Mar 2017

methods, and then the head central coordinates (Sx, Sy) of the standard head is calculated.

(2) Set the movement value:

We take a variable to stored the movement by which the cursor will move (Kx, Ky).

(3) Judge the head movements:

Analyze the images after initialization. The head central coordinates of one image is noted as (Cx, Cy). We compare (Cx, Cy) with (Sx, Sy) to get the following conclusions:

If Cx - Sx=+Kx, the judgment is that head moves by a value of Kx,+ is abbreviated as right movement.

If Cx - Sx = -Kx, the judgment is that head moves by a value of Kx,- is abbreviated as left movement.

If Cy - Sy =+ Ky, the judgment is that head moves by a value of Kx,+ is abbreviated as up movement..

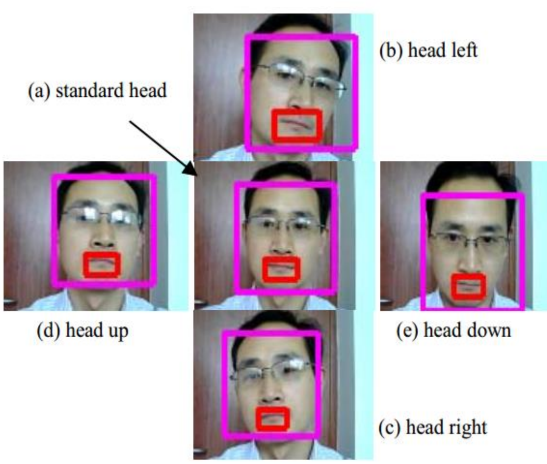
If Cy – Sy= -Ky, the judgment is that head moves by a value of Kx,- is abbreviated as down movement.

If | Cx - Sx | =0 and | Cy - Sy | =0, standard head.

(4) Standard head relocation:

If the standard head has been detected in several continuous images, the average value of these head central coordinates will be calculated as the new head central coordinates (Sx, Sy) of the standard head.

(5) Go back to step (2).

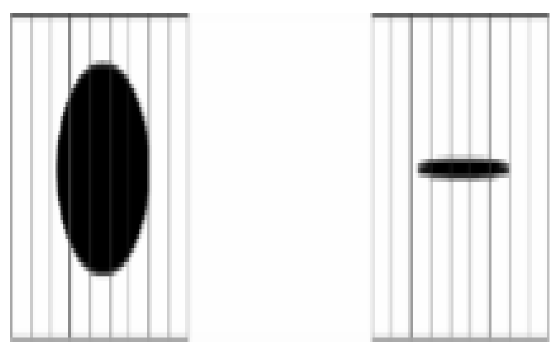


Algorithm for EYE MOVEMENT:

There has been some success in tracking the eye, but not to the extent of determining gaze direction. Note that it is not the pupil but the whole eye that is being tracked. The brightness contrast between white-eye sclera and dark iris and pupil, along with the texture of the eyelid, provides a distinctive template. In addition, rotating the head may cause the eye to be blocked by the nose and not be visible at all.

IV. STARBURST ALGORITHM

Presented in this section is an eye-tracking algorithm that combines feature-based and model-based approaches to achieve a good trade off between run-time performance and accuracy for dark-pupil infrared illumination. The goal of the algorithm is to extract the location of the pupil center and the corneal reflection so as to relate the vector difference between these measures to coordinates in the scene image. The algorithm begins by locating and removing the corneal reflection from the image. Then the pupil edge points are located using an iterative feature-based technique. An ellipse is fitted to a subset of the detected edge points using the Random Sample Consensus (RANSAC) paradigm. The best fitting parameters from this feature based approach are then used to initialize a local model based search for the ellipse parameters that maximize the fit to the image data.



Future Enhancement-

For better performance in future of the application, voice recognition can be added. There is always scope for innovation when it comes to technology. Even our project is no exception. Some possible improvements that can be made in the project in the near future.

V. Conclusion

The experiences with the Mouseless system are very encouraging. They show that the Mouseless system can successfully provide computer access for people with severe disabilities. It is a user-friendly communication device that is especially suitable for children.

The system tracks many body features and does not have any user-borne accessories, so it is easily adaptable to serve the special needs of people with various disabilities. To meet the current demand, additional Mouseless systems are being installed. A single-computer version of the system is being developed.

REFERENCES

[1] I. Bacivarov, M. Ionita, and P. Corcoran. *Statistical models of appearance for eye tracking and eye-blink detection and measurement*. IEEE Transactions on Consumer Electronics,, 54(3):1312–1320, August 2008.

[2] 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 Transactions on Neural Systems and Rehabilitation Engineering, 10:1–10, 2002.

[3] Camera mouse, January 2010. http://www.cameramouse.org

[4] M. Divjak and H. Bischof. *Eye blink based fatigue detection for prevention of computer vision syndrome*. In Proceedings of the IAPR Conference on Machine Vision Applications (MVA 2009), pages 350–353, May 2009.

[5] C. Fagiani, M. Betke, and J. Gips. *Evaluation of tracking methods for human-computer interaction*. In Proceedings of the Sixth IEEE Workshop on Applications of Computer Vision (WACV '02), pages 121–126, December 2002.

