INTERNATIONAL JOURNAL OF TECHNO-ENGINEERING
IJTE
ISSN: 2057-5688

Mouse Cursor Control Using Facial Movements-An HCI Application

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Abstract: Physically disabled people are an important part of our society that has not yet received the same opportunities as others in their inclusion in the Information Society. Therefore, it is necessary to develop easily accessible systems for computers to achieve their inclusion within the new technologies. This project presents whose objective is to draw disabled people nearerto new technologies. In this project the assistive multimodal system is presented, which is aimed for the disabled people, which need other kinds of interfaces than ordinary people. The group of users of this system is persons with hands disabilities. The interaction between a user and a machine is performed by the algorithm enables physically disabled individuals to controlthe computer cursor movement to the left, right, up, and down. The algorithm also enables theperson to open and close folders or files or applications through a clicking mechanism. It givesthe opportunity for disabled people to carry out a work with PC.

I. INTRODUCTION

Moving the finger or the computer mouse has become a common way to move the computer cursor along the computer screen in the present technology. To map it to the movements of the cursor the system detects any movement in the computer mouse or the human finger. This current technology will not be able to make use by some people like ‘amputees’ as they do not have their hands to operate. Hence, the amputee and other physically challenged people can be able to operate, if their eyeball movement can be mapped to the cursor. If the direction of the eyeball movement is traced and direction towards which eye is looking at can be tracked, the cursor will be mapped and the physically challenged people can able to move the cursor. An ‘eye tracking mouse’ will be of a lot of use to disabled and an amputee currently, this technology is not available at a large scale, only a few companies are trying to develop this technology and have made it available. This project intend to develop an eye tracking mouse where most of the functions which present in the computer mouse will be available, so that an amputee or disable people can operate mouse using their eye. Eye tracking technology has become one of the most popular techniques within the human and computer interaction (HCI) this is very important for the people who have difficulty with speech and movement disabilities, especially for the handicapped and amputees person. The idea of computers with the eyes will remove the help required by other person to handle the computer. Moving the finger or the computer mouse has become a common way to move the computer cursor along the computer screen in the present technology. To map it to the movements of the cursor the system detects any movement in the computer mouse or the human finger. This current technology will not be able to make use by some people like ‘amputees’ as they do not have their hands to operate. Hence, the amputee and other physically challenged people can be able to operate, if their eyeball movement can be mapped to the cursor. If the direction of the eyeball movement is traced and direction towards which eye is looking at can be

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tracked, the cursor will be mapped and the physically challenged people can able to move the cursor.

II.LITERATURE REVIEW

Development of assistive devices based on computer control is increasing day by day. These assistive device can be used for the physically challenged people to interact with many applications such as communication (mobile phone, tablet PC), living environmental control (intelligence home appliance control), education and entertainment (video games). In order to design a human assistive device based on facial features, it is essential to review the research works related to facial features recognition methods. Recent years, vision based systems are more popular on designing and developing different types of application oriented systems such as biometric, security systems, etc. Face recognition systems are being tested and installed in the airports to provide new level of security . Indeed, human-computer interfaces (HCI) based on facial expression and body gestures are being exploited as a way to replace the traditional interfaces such as the mouse and keyboard. And actions of face could play an important complementary or supplementary role to that played by the hands in machine-interaction (HMI) . Ideally, acquisition of facial features is uses as an automatic face detector and it allows locate the faces in complex scenes with cluttered backgrounds . Here, the limitations on out- of-plane rotations can be addressed by using different type of warping techniques. In this approach, the center positions of distinctive facial features such as the eyes, nose and mouth are considered as a reference points in order to normalize the test faces according to some generic or reference face models . Scale changes of faces may be tackled by scanning images at several resolutions in order to determine the size of present faces, which can then be normalized accordingly . Several face detection algorithms have been developed by different researchers. In general, face detection techniques are categorized into two main categories, the feature-based approach and the image-based approach. Most of the vision based approaches are exhaustively scan the facial images at different scales for face detection. However, this approach requires more time for facial recognition and window scanning technique is more complex. In contrast to this approach, the feature-based approach eventually leads to the localization of facial features for face recognition. Hence, most of the real time applications are adopting with feature based approach for face recognition . The most well-known method that is applied in the feature based approach is skin model which is effective in image segmentation and face extraction. The inspiration to use skin color analysis for initial classification of an image into probable face and non-face region stems from a number of simple but powerful characteristics of skin color . Firstly, processing skin color is simpler than processing any other facial feature. Secondly, under certain lighting conditions, the color is orientation invariant. The major difference between skin tones is intensity, e.g. due to varying lighting conditions and different from the color of most other natural objects in the world. Yangpresented a review of face detection methods, which fell into a small number of categories, the most important of which were methods depending of the color and physiognomy of the face. Störring suggested that a face's apparent color was due to two factors: the amount of melanin in the skin and the ambient illumination. Of the two, ambient illumination caused the greater variation to the perceived color. They concluded that if normalized color values were used (i.e. the effect of illumination were removed) then skin colors were consistently with a fixed and quite narrow set of limiting values, independent of the subject's natural skin

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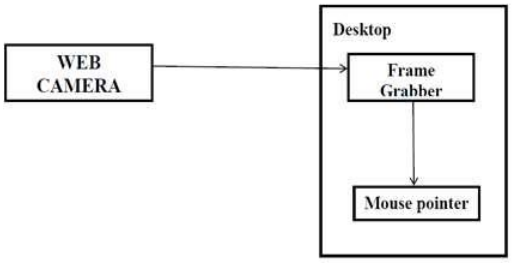
coloration. This approach, and slight modifications, has become very popular due to its simplicity.

III. IMPLEMENTATION

System Architecture



Methodology

Web camera: A webcam is a video camera that feeds its image in real time to a computer or computer network. It is a hardware device that inputs images of the User and supplies it to the frame grabber. Just like a digital camera, it captures light through a small lens at the front using a tiny grid of light-detectors that converts the picture in front of the camera into digital format. Unlike a digital camera, a webcam has no builtin memory chip. Hence, it transmits them immediately to a computer. Desktop: Most of the processing takes place on the desktop. It only has to display the image received from the web camera and provide display to the user. It has the following components: Frame grabber: A frame grabber is an electronic device that captures individual, digital still frames from an analog video signal or a digital video stream. It is usually employed as a component of a computer vision system, in which video frames are captured in digital form and then displayed, stored or transmitted in raw or compressed digital form.Mouse Pointer: The mouse cursor, or mouse arrow, or mouse pointer is often shaped likean arrow or a small hand with the index finger pointing towards the top of the display device. The mouse pointer moves as the user moves his or her head and blinking of eyes triggers clicking events.

Algorithm for Head Movement tracking

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.

Adaboost Face Detection Algorithm

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
2. methods, and then the head central coordinates (Sx, Sy) of the standard head is calculated.
3. Set the movement value: We take a variable to stored the movement by which the cursor will move (Kx, Ky).
4. Judge the head movements: Analyze the images after initialization. The head

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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.

5. 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.
6. 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 ot be visible at all.

IV. RESULT

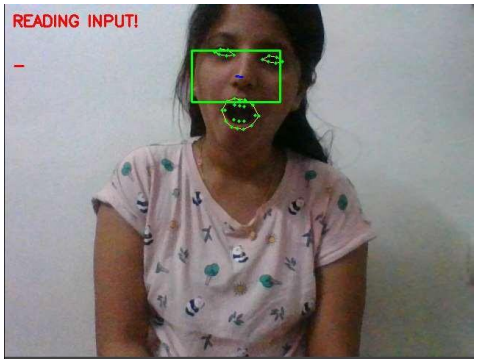

Fig-3.1: Reading Input

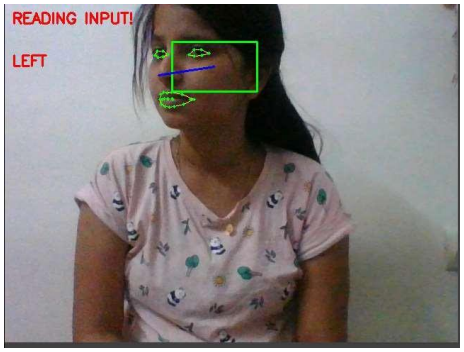

Fig-3.2: Head Left for cursor goes Left

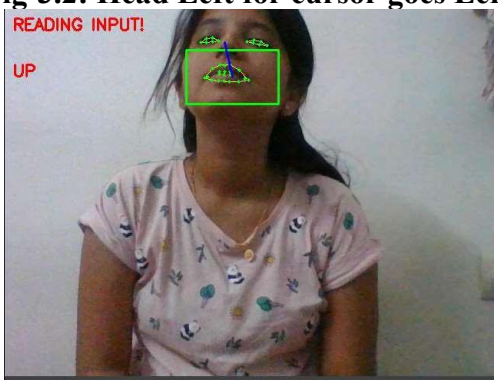

Fig-3.3: Head up for cursor goes up

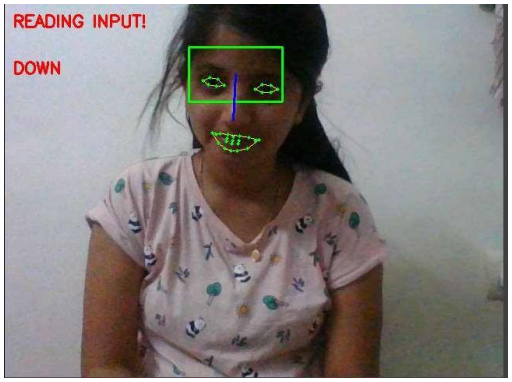

Fig-3.4: Head Down for cursor goes down

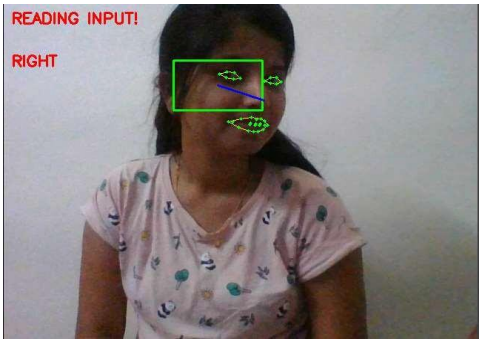

Fig-7.5: Head Right for cursor goes Right

V. CONCLUSION

ISSN: 2057-5688

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.

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