Eyeball Movement Based Cursor Control

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***Abstract*— An innovative method of accessing a computer completely hands-free, is what we intend to present in this paper. The computer shall now be accessible and easily maneuvered through, using merely one's EYES! The paper attempts to present a hands-free method of computer control by adjusting to the individual's pupil movement, simulating the same onto the cursor, and taking inputs that would otherwise be given by a mouse or keyboard that need hands to access. Indeed, one shall not only control a mouse using his eyes, but also access the complete INPUT methodology**

***Index Terms*— Webcam,Matlab,Computer Vision Toolbox.**

I. INTRODUCTION

As the computer technology is grow up, the importance of human computer interaction is rapidly increasing. Most of the mobile devices and laptops are using touch screen technology. But this technology is still not cheap enough to be used on desktop systems .Creating a virtual human computer interactive module such as mouse or keyboard, can be an alternative way for the touch screen. The motivation is to create an object tracking application to interact with computer develop a virtual human computer interaction device.

In our work, we used Matlab to call web camera which is set to take images continuously from the eye focusing pupil. With the help of different image processing techniques, the eye recognition and tracking is achieved. Depending upon the size of the image taken by camera various scaling techniques are used because, the pixel position in the image will not have a correspondence with screen resolution.

Existing system:

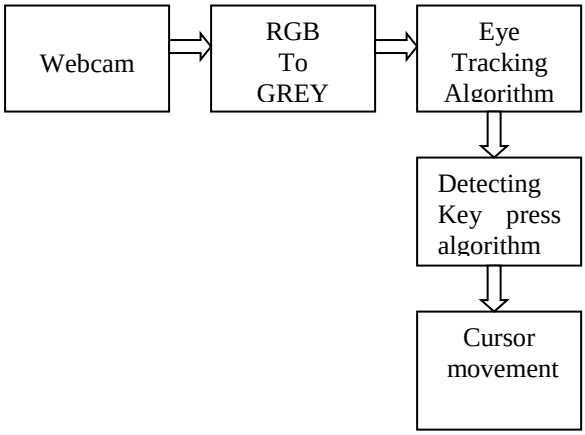
Now a day, the system use by users to operate computer is by using their hands and touch pad system. Input is based on speech & mouse clicks to give output. Also users use wireless system to operate computers, laptops, mobile phones etc

Proposed system:

The proposed system is based on existing system. The most important part in our system is that the system can be able to use by both the persons whether they are normal persons or handicapped. The current system is not able to do this so we are developing a new system which will help a lot to disable peoples and also illiterate peoples. Current system focuses more on normal users but our system is friendly to all types of users whether they are normal, visually impaired or else illiterate. When using this system the computer will guide the user for performing the operation which he/she wants to perform.

II. BLOCK DIAGRAM:

PC with MATLAB software



III. WORKING

ALGORITHM

A complete procedure is presented that moves the mouse from one place to another on desktop through user's eyes movement. Before the processing for the movement of mouse begins, detailed processing is presented below:

1. Camera receives the input from the eye.
2. After receiving these streaming videos from the cameras, it will break into frames.
3. After receiving frames, it will check for lighting conditions because cameras require sufficient lights from external sources otherwise error message will display on the screen.
4. The captured frames that are already in RGB mode are converted into Black 'n' White.
5. Images (frames) from the input source focusing the eye are analyzed for Iris detection (center of eye).
6. After this, a midpoint is calculated by taking the mean of left and right eye centre point.

7. Finally the mouse will move from one position to another on the screen and user will perform clicking by blinking their eyes for 5 seconds.
8. Display the image.
9. Again a loop is used to bind the black objects in a rectangular box.
10. Stop the video acquisition.
11. Flush all the image data stored in the memory buffer
12. Clear all the variables.
13. End.

PROGRAM ANALYSIS

The grey region of the image obtained after subtraction needs to be converted to a binary image for finding the region of the detected pupil (Figures 3-5). A grayscale image consists of a matrix containing the values of each pixel. The pixel values lay between the ranges 0 to 255 where 0 represents pure black and 255 represents pure white color. We use a threshold value to convert the image to a binary image. This means that all the pixel values lying below threshold value is converted to pure black that is 0 and the rest is converted to white that is thus the resultant image obtained is a monochromatic image consisting of only black and white colors. The conversion to binary is required because MATLAB can only find the properties of a monochromatic image. Final output image: (after boundary detection and centroid): For the user to control the mouse pointer it is necessary to determine a point whose coordinates can be sent to the cursor. With these coordinates, the system can control the cursor movement. An inbuilt function in MATLAB is used to find the centroid of the detected region. The output of function is a matrix consisting of the X (horizontal) and Y (vertical) coordinates of the centroid. These coordinates change with time as the pupil moves. Centroid of the image is detected Coordinates are located and stored in a variable Now the required pupil tracking of eye is achieved. The required Program for mouse movement operation is imported in Matlab. The pointer location is determined by assigning X and Y position of bounding box. If the X and Y positions of Bounding box varies, accordingly the position of the cursor will also vary. Now the mouse movement in computer screen is achieved by using pupil of eye movement detection that can be an alternative approach for the touch screen. Works can be done to perform the operations using the inbuilt.

EYE TRACKING TECHNIQUES

There is no universal technique to track the movement of the eyes. In any study, the selection of the technique rests with the actual demands of the application. During the analysis phase of this research, three techniques were analyzed; the Limbus tracking, Pupil tracking, and Electrooculography. Every technique has its own robust points and disadvantage.

LIMBUS TRACKING:

Limbus Tracking explains a way of tracking the eye using the limbus. The limbus is the boundary between the white sclera of the eye and the darker iris. As the sclera is white and the iris is darker, this boundary can easily be visually detected as well as tracked. This technique is based on the position and shape of the limbus relative to the head, therefore the head must be kept quite still or the apparatus must be fixed to the user's head. This technique is negatively affected by the eyelid often concealing all or part of the limbus. This makes its uses limited to horizontal tracking. Usually this technique does not involve the use of infrared light.

PUPIL TRACKING:

Pupil tracking is a technique of gaze detection that is commonly used often in conjunction with different forms of tracking. There are several reasons for this; however the main advantage is the notion of the “bright spot”. Like the situation associated with red eye when taking flash photographs at night, infrared can used in pupil detection to form a high intensity bright spot that is easy to find with image processing. This bright spot occurs when infrared is reflected off the back of the pupil and magnified by the lens. The main advantage of pupil tracking is that as the border of the pupil is sharper than the limbus, a higher resolution is achievable. Also, as the pupil is never really covered by the eyelid, x-y tracking is more feasible as compared to Limbus tracking. The disadvantage is that the difference in contrast is lower between the pupil and iris than between the iris and sclera-thus making the border detection more difficult.

WORKING MODE

Click (blink)

To use the click or select function of the generic mouse, the user will have to blink both his/her. We will be using the blink detection techniques in. To avoid unintentional inputs from motions likes sneezing and occasional blinking, the blink duration for a left-click shall be at least 1 second. The user may also choose to vary this duration according to convenience. Any blink that is shorter or longer than the intended set duration by more than 0.2 seconds shall be ignored.

Double Click (blink twice)

In order to double click, the user will have to blink twice, each blink being of the same length as the set duration. The interval between the two blinks shall be less than 0.2 seconds too.

Right Click (wink)

In order to right click, the user will have to wink using either eye. The wink duration shall work similar to the mechanism followed by blink for single clicking. Winking shall open any properties of the selected or hovered over area, just like the function of a generic mouse at its right click.

Scroll

The user shall be able scroll through the pages after using this option from the task bar.

Drag

The user will be able to drag and drop items with the option on the task bar. The will be able to drag and drop even multiple items that have been selected.

Multi-select

This function is analogous to the drag function when used with a generic physical mouse; but the reason for having a separate option here is to avoid discrepancies where the user accidently drags any multi-selected items unintentionally.

Keyboard

By selecting this option, the user will be provided with an onscreen keyboard, which will have the Swype feature for quick typing of words. The Swype technique is used for touchscreen devices for fast typing and this feature shall prove extremely effective with gazing. When using this option, the user will still have access to other taskbar options without hiding the keyboard. The user will have to gaze back at the keyboard in order to hide it from view.

Multi-Key

This option will only appear in the taskbar when the onscreen keyboard is selected. It will allow the user to select combination keys, e.g. Alt+F4. In order to access any of these features from the taskbar, the user will have to first gaze at the selected area on the screen, then gaze at the option on the task bar and then back at the selected icon or area; except with the keyboard.

IV. ACKNOWLEDGEMENT

It gives me a great pleasure to submit this Project. This is the only page where I have the opportunity to express my emotions and gratitude from the bottom of my heart.

I express my sincere thanks to my guide Prof.D.H.Linge for guiding me at every step in making of this project. He motivated us and boosted my confidence and I must admit that the work would not have been accomplished without his guidance and encouragement.

I would like to extend my special thanks to HOD **Prof. Raut D.M.** and Principal **Dr. Pawar M.S.** for spending their valuable time to go through my report and providing many helpful suggestions. Lastly I would like to thank all the staff member of electronics department and my friends without whom the project report would not have been completed

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