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Implementation Paper on Retina Based Cursor Movement Control

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Abstract:-

This paper presents a new system that uses the human iris for computer interaction. With the recent advances in technology, modern computer systems are becoming more flexible. Modern computers are capable of processing millions of information per second. In such cases, traditional input devices such as a mouse or keyboard are relatively slow. This can be overcome by human interaction with the computer. With innovation and development in technology, motion sensors are able to capture the position and natural movements of the human body. This has made possible a new way of communication with computers. So keeping all this in mind we propose such a system, which is an untouched and fast communication system. This system will be able to capture the movements of the eyeball for which it is responsible cursor control. The system processes the data in the camera feed and calibrates the parameter interface according to the user. The system then performs computer-related algorithms to determine the location of the doll's and use eyes to implement natural eye-computer interactions

.Keywords:

Human Iris, Cursor Control, Electro-oculography,CAMSHIFT algorithm, Limbus Limbus Tracking, Pupile Pupil tracking.

I. Introduction:-

Human beings today have become accustomed to efficient and fast results to reach various tasks of daily life. Thus effective technology is evolving to meet human needs. Introduced computers have been improved and they can give us more efficient results. Replacing eyes with mice. What we are doing here is using the mouse cursor to locate and track the eyes using tracking. In this we are using a webcam to locate the iris which is then converted into gray scale format which will help us to locate and track the eyes. After tracking we will do some operation like click, double click, right click, left click etc. It will save our time by working faster than mouse. It will also be useful for physically challenged people so that they can use it.

II. Literature Review:-

[1] In this paper they intended to be used by disabled people who face a lot of problems in communicating with fellow human beings. Thiswill help them use their voluntary movements, likeeyes and nose movements to control computersand communicate through customized, educational software or expression building programs. Their proposed algorithm tracks the motion accurately to control the cursor, thus providing an alternative to computer mouse or keyboard. Primarily approaches to camera-based computer interfaceshave been developed. However, they were computationally expensive, inaccurate or suffered fromocclusion.

Electro-oculography

(EOG) isa technology where a electrode around user eye record the movement. The problems with this technique is that for using this the disabled person needs someone help to put it and also the system is quite expensive.

Another example is CAMSHIFT algorithm uses skin color to determine the location and orientation of head. This technique is fast and does not suffer from occlusion;this approach lacks precision since it works well for translation movement but not rotational movement.

[2] An eye tracker is a device for measuring eye positions and eye movement. In this study, the selection of the technique rests with the actual demands of the application. During the analysis phase of their research, three techniques were analyzed; the Limbus tracking, Pupil tracking, and third tech is Electrooculography. Each technique has its own Strong points and drawbacks.

A. Limbus Limbus Tracking explains a method of tracking the eye using the limbus. The limbus is the boundary between the white sclera of the eye and the darker iris.

B. Pupile Pupil tracking is a method of gaze detection that is commonly used often in conjunction with other forms of tracking. There are several reasons for this, but the main advantage is the notion of the “bright spot”. Similar to the case of red eye when taking flash photographs at night, infrared can be used in pupil detection to create 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.

C. Electro-oculography The third category uses electric potentials measured with electrodes placed around the eyes. The eyes are the origin of a steady electric potential field, which can also be detected in total darkness and if the eyes are closed. It can be modeled to be generated by a dipole with its positive pole at the cornea and its negative pole at the retina. The electric signal that can be derived using two pairs of contact electrodes placed on the skin around one eye is called Electro-oculogram.

[3] In iris tracking, the motion and direction of iris isdetected for designing and implementing an eyetracking system for developing a human computer interface. In this paper batchmode is used for iris detection. The system allowedthe users to interact with the computer system byusing their eye movements. The system accuratelylocated and detected the eyes in images with differentiris positions and used this information to move thecursor accordingly as this iris has trackingmethod has been conducted on static images so itprovided a higher degree of accuracy. The developedsystem is restricted to work only when the direction ofiris is left, right or center. It doesn't work when theposition of iris is up or down. The system is notexpanded to work in real time and is not able tohandle blinks and dose eyes.

III. System Designs

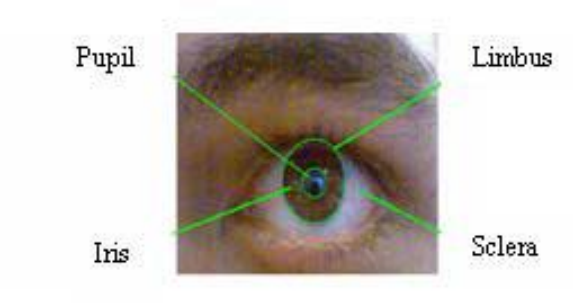

Fig.1. Diagram of eye

VI. System Figures

Following are the figures for Retina Based Mouse Control Movement Control

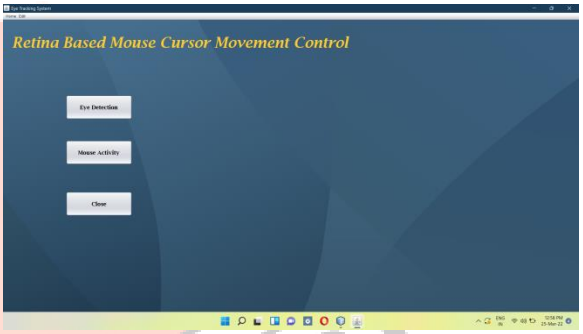

Fig : 1

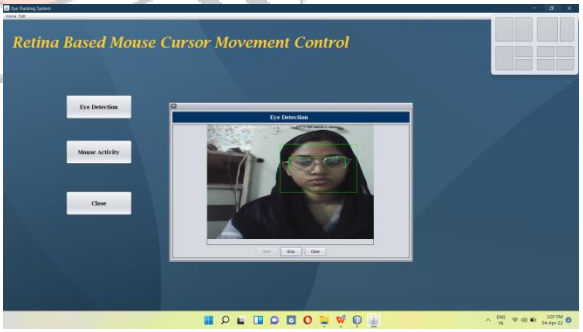

Fig : 2

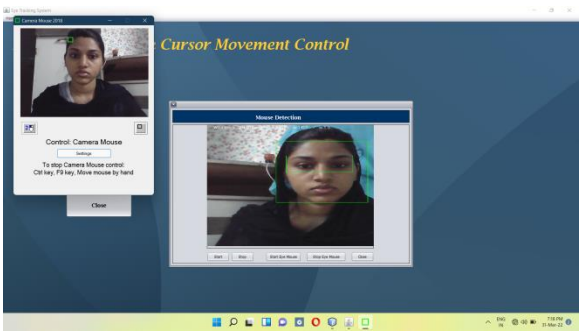

Fig : 3

V. System Design & Implementation

The pupil detection and tracking is an important step for developing a human-computer interaction system. To develop a human eye-computer interaction system, we examine pupil detection and tracking by image processing techniques. In the image processing techniques, the illumination directly influences the image quality in general. If influences of illumination are little, we can obtain an image of good image quality. The subsequent image processing techniques are expected almost to succeed. In this paper, in order to avoid the influences of illumination, we have tried to combine the hardware constitution of an infrared light-emitting diode (LED) light, a sensitive infrared camera, and an infrared (IR) filter. In the experiment with this hardware constitution, we investigate the effects of the pupil detection and tracking by image processing techniques for a human eye-computer interaction system.

Traditional human-computer interfaces demand manual dexterity. Unfortunately, people with physical disabilities cannot fully enjoy the benefits provided by computer systems. This is because the conventional mouse and keyboard were designed to be used by those who are able bodied. The task of reducing or eliminating the communication barriers between man and machine is an arduous task (Kaufman et. al., 1993 and Magee et. al., 2005). There is little motivation in providing an alternative communication tool for those whose physical abilities are extremely limited. Human eye movements have the potential to be a convenient, natural, high bandwidth and fast input mode of computers due to their communication power.

Algorithm

The goal of the eye-tracking algorithm is first to locate the eyes of the user from an image and then use the location information to perform certain functions. Static images are retrieved from an image library and are used to initiate the system. In the first stage, an efficient image enhancement sharpening filter is employed. This is followed by a simple method to segment the eyes. Following this, an iris detection method is used to find the direction of the user's gaze and finally the computed direction information of eye movements is used to drive the computer interface. Each step will be explained in detail in the following sections.

Step 1. Image Enhancement

The first step after retrieving the input image is to enhance it. This increases the image definition by improving contrast. In the presence of noise, the sharpening and smoothing of the image are important pre-processing steps. These are usually the precursors in many operations such as object recognition, edge detection, feature extraction and pattern recognition (Liu et. al., 2002). Smoothing removes noise but typically also blurs edges. To facilitate edge detection and other similar processes,deblurring (sharpening) of the image is required. After several experimental enhancement schemes, it was found that the un-sharp filter provided results that were closest to the ones

desired. The unsharp filter is created from the negative of the Laplacian filter. Certain parameters are tuned to provide improved results.

Step 2.Boundary Tracing

Tracing the boundaries of the eyes is important as finding the outline of the eyes makes it easier (computationally) to localize the position of the irises. The eye boundaries in the binary image were found by tracing the exterior boundaries of objects, as well as boundaries of holes inside these objects. The boundaries of the outermost objects (parents) are traced along with their children

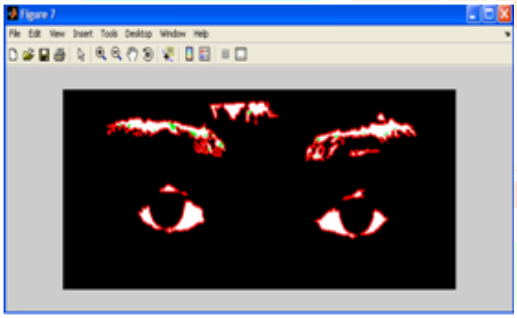

Fig : Boundary Traced Image

Step 3. Iris and Pupil Detection

Several calculations were performed on both cropped images in order to detect the actual position of the iris. This in turn indicates which direction the user is looking in. There were 8 parameters calculated, namely: *(min_x, y_min_x,max_x, y_max_x, min_y, x_min_y, max_y,x_max_y).*

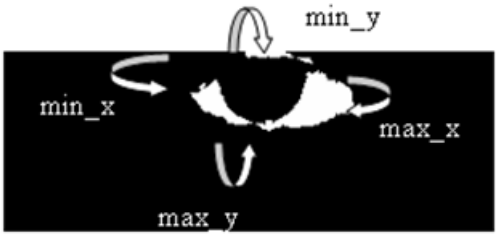

Fig : Eye Parameter

Steps 4. Driving the Interface

Mouse events were triggered based on the calculated values of the *lok*variable. All mouse events were generated in Visual C. When the value of *lok*is calculated as 1, the cursor moves to the left. Similarly, when value of *lok*is 2, the cursor moves to the right. When the user is looking straight i.e. the iris is in the center and *lok*is 3, then the mouse click is generated at the current position of the mouse.

Fig : User looking Straight, Left & Right Respectively

VI. Conclusion:-

This paper focuses on providing the overview about the various eye based cursor movement techniques developed &proposed. Hence we successfully completed our project by using eye tracking algorithm for developing low-cost based system aims to handle & also affordable for the majority of the physically challenge subjects. Thus this paper shows how we can access our computer machine with respect to human iris.

VII. Acknowledgement:-

First and foremost, I would like to expressmy sincere gratitude to my **Dr. V. K. Shandilya** who has in the literal sense,guided and supervised me. I am indebtedwith a deep sense of gratitude for theconstant inspiration and valuable guidancethroughout the work.

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