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Implementation Paper on Live Eye Gaze Tracking to control Mouse Pointer Movement

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Abstract

This paper presents a new system that uses the human iris for computer interaction. With 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 these in mind we propose 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..

Key Words

Interaction systems, Eye Gaze system, Speech synthesize, Human Iris, Cursor Control

1. INTRODUCTION

Human beings today are accustomed to efficient and fast results to reach various tasks of daily life. Thus the resulting technology is evolving to meet human needs. Introduced computers have been improved and replacing the mouse by eye can give us more efficient results. 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 will help us to locate and track the eyes when converted to gray scale format. 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.

2. LITERATURE REVIEW

[1]. 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.

[2]. In this paper, an individual human computer interface system using eye motion tracking is introduced. Traditionally human computer interface uses mouse, keyboard as an input device. However, the proposed vision-based virtual interface controls system work on various eye movements such as eye blinking. The planned virtual multimodal interface system provides vision-based mechanism, to convey between human and computer system, instead of conventional human computer interaction through mouse and keyboard. For motion tracking, recognition of eye is explored through an optical flow technique. To minimize the error caused by light variation, histogram equalization and max-min normalization is used to improve every frame. An innovative system for user-computer interaction based on the user's eye-gaze behavior.

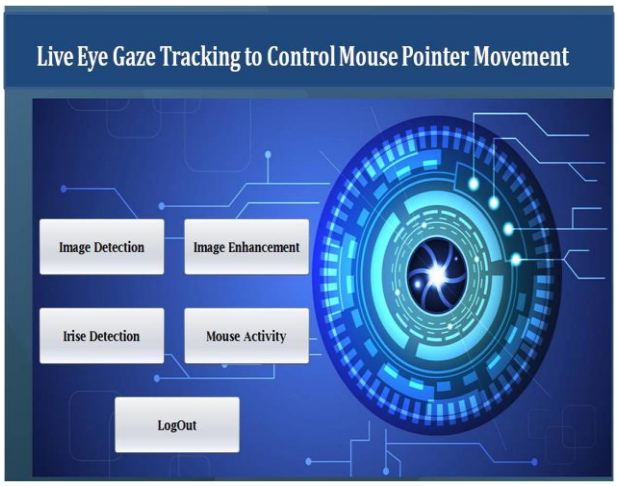
[3]. In this paper we roughly describe some representative studies in the field of eye tracking, covering some aspects regarding different types of devices, algorithms for pupil detections, image processing or data filtering and also some well known applications in assistive technology, human computer interaction, virtual reality, psychology or eBlearning. As a general tendency we can conclude that in the future eye tracking approaches will be a hot subject for researchers. It is argued by some traditional conferences, international projects, books and scientific papers and technical reports. For example, held once every two years, Eye Tracking Research & Application (ETRA) Conferences join together companies and researchers involved in eye tracking technologies and highlightnew hardware and software solutions. Among many others research groups, EyeBCom Corporation is an advanced center for eye tracking research and development dedicated to the creation of innovative eye tracking technology to improve and save lives, support the advancement of research, and revolutionize humanBtechnology interaction. Special attention should be paid for performing experimental procedures in order to evaluate the usability, accuracy and reliability of the eye tracking systems.

[4]. This research provides a system that is able to trigger mouse movements for controlling an interface for the people who are suffering from some kind of severe. Physical disabilities and who cannot use the system with their hands. The

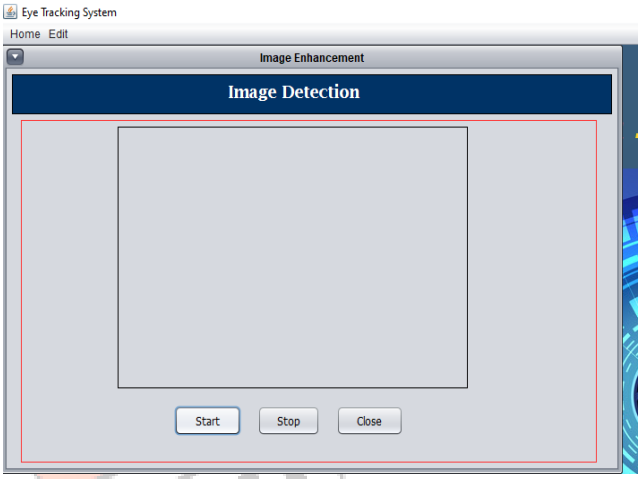
system is able to track eye movements efficiently and accurately by using the pupil portion and can accurately detect eye blinks whether voluntary and involuntary. The system can track eye portion with the 90% detection accuracy. The system is expanded to work in real time using recorded videos. The proposed system is purely non-intrusive as no hardware device has been attached to the human body so the system is user friendly and easier to configure. There are still some aspects of the system that are under experimental conditions and development. But this project proved to be an overall success and achieved the goals and requirements as proposed in the system specifications. Many aspects of the system can be a part of the future work for making more efficient and robust eye tracking system. The system can be shifted fromr ecorded videos to a live web cam video with some modifications, for making it a live system. The system can be developed in such a way so that it could also detect human eye gazes and act accordingly. There can be some kind of mouse action when the blink is detected. System efficiencycan be achieved for making it a more efficient dynamic system.

3. SYSTEM DESIGN

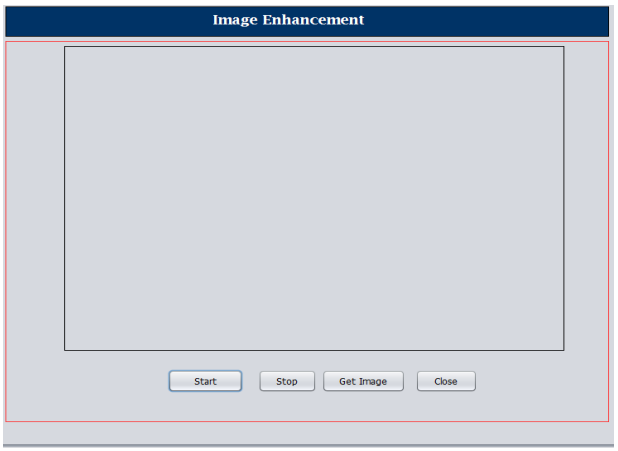
Screen shot 1: Home page



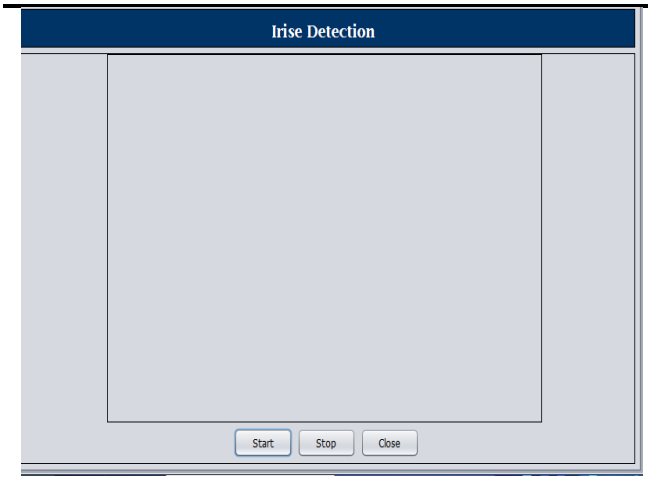
Screen Shot 2 :



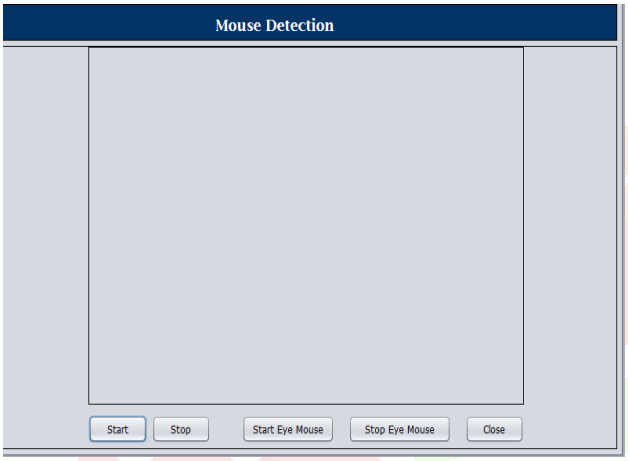
Screen shot 3: Image Detection



Screen shot 4: Image Enhancement



Screen shot 5: Iris Detection



Screen Shot 6 : Gaze Tracking to Control Mouse Cursor Movement

4. IMPLEMENTATION DETAILS

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

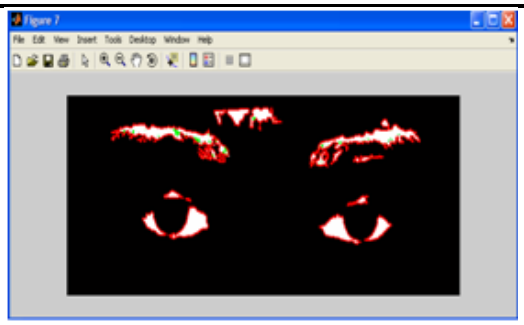


Fig : Boundary Traced Image

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).

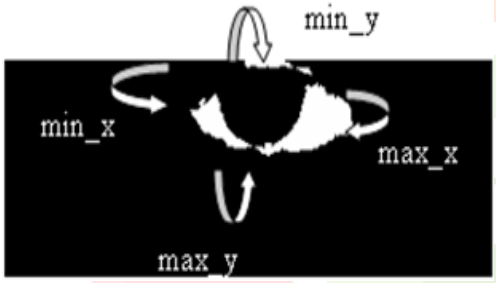


Fig : Eye Parameter

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 lokis 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

5. CONCLUSION

This paper focuses on providing an overview of the various eye-based cursor movements of the techniques developed and proposed. We therefore conclude that we will develop a low-cost system that aims to address the most physically challenging issues and affordability. Thus this paper shows how we can access our computer machine in terms of human bubble

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