International Journal of Electronics Communication and Computer Engineering
Volume 3, Issue 6, ISSN (Online): 2249–071X, ISSN (Print): 2278–4209

Process Eye Gaze for System Interface & Implementation

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Abstract – **People with physical disabilities can do many things with their eyes that they would otherwise do with their hands. Simply by looking at control keys displayed on a computer monitor screen, the user can perform a broad variety of functions including environmental control, sending emails, browsing the Internet, playing games, typing, and controlling most PC. This project is base on the application of eye movements to user interfaces both for analyzing interfaces, measuring usability, and gaining insight into human performance and as an actual control medium within a human-computer dialogue. The eye movements do not affect the interface in real time. As a direct control medium, the eye movements are obtained and used in real time as an input to the user-computer dialogue. They might be the sole input, typically for disabled users or hands-busy applications, or they might be used as one of several inputs, combining with mouse, keyboard, sensors, or other devices. Interestingly, the principal challenges for both retrospective and real time eye tracking in human-computer interaction turn out to be analogous. For retrospective analysis, For real time use, the problem is to find appropriate ways to respond judiciously to eye movement input, and avoid over-responding; it is not nearly as straightforward as responding to well-defined, intentional mouse or keyboard input.**

Keywords - **Eye tracking, Algorithms, Eye Gaze, Mouse.**

I. Introduction

Computers are now widely used in our daily lives, and it is difficult to live without them in our offices and homes. The use of computers is also changing. In the near future, computers will be integrated and embedded into everything, so the term “using a computer” will become redundant. The diversity of computers requires improvements in computer operation methods. Typical peripherals for operating a computer, like a keyboard and mouse, provide efficient and effective access to the computer. However, they are not suitable for the emerging computer styles. For example, who can imagine that the numerous computers in a home will each have a keyboard and a mouse? Such peripherals also create an information barrier: users have to spend a lot of time acquiring the operation skills needed. For those people who cannot use them, computers are simply inconvenient tools.

Imagine yourself being an intelligent, motivated, and working person in the fiercely competitive market of information technology, but just one problem you can't use your hands. Or you can't speak. How do you do your job? How do you stay employed? You can, because of a very good gift from embedded system: THE EYE GAZE, a communication & control system you run with your eyes. The Eye gaze System is a direct-select vision-controlled communication and control system. By looking at control keys displayed on a screen, a person can synthesize speech, control his environment (lights, appliances, etc.), type, operate a telephone, run computer software, operate a computer mouse, and access the Internet and e-mail. Eye gaze Systems are being used to write books, attend school and enhance the quality of life of people with disabilities all over the world.

II. Evaluation

Kyung-Nam Kim & R. S. Ramakrishna developed Non-intrusive eye gaze tracking that allows slight head movement [1] .Baosheng Hu Minghua Qiu’s paper is concerned with a simple method for realizing the human computer interaction by using the eye gaze as input for computer[2]. A new and low cost method for quick searching and detecting the eye gaze position is successfully developed, which includes a quick match method for locating pupil's center and an efficient eye gaze detecting algorithm. Dodge and Cline developed the first precise, non-invasive eye tracking technique, using light reflected from the cornea. Their system recorded only horizontal eye position onto a falling photographic plate and required the participant’s head to be motionless. After this, Judd, McAllister & Steel applied motion picture photography to record the temporal aspects of eye movements in two dimensions. Their technique recorded the movement of a small white speck of material inserted into the participants’ eyes rather than light reflected directly from the cornea.

III. Architecture of Eye Gaze

To use the user’s gaze for HCI, it is important that gaze tracking should not disrupt the user’s activities. Traditional input devices do not demand much effort to operate them. We can use them as soon as we want to operate the computer, and there are few restrictions on our behaviour during these activities. Gaze-based HCI should be more comfortable, or at least, as comfortable as other methods currently in use. Therefore, gaze-tracking systems will play an important role in achieving the required comfortable operation. The Structure of the eyeball is shown in Fig.1. To use gaze for HCI, the gaze-tracking system should meet the following requirements.

1) Little or no configuration setup, including personal calibration. Existing gaze-tracking systems require personal calibration for accurate gaze detection, where the user looks at five to twenty calibration markers on the display (Fig.2).

2) Free movement of the user's head position. Many gaze-tracking systems prevent the user from moving his head freely because a fixed camera is used to detect the user's eye. This limitation greatly hinders comfortable computer Operation.
3) No eye-detection camera or other attachments near the user's eye; otherwise, continuous use is tiring.

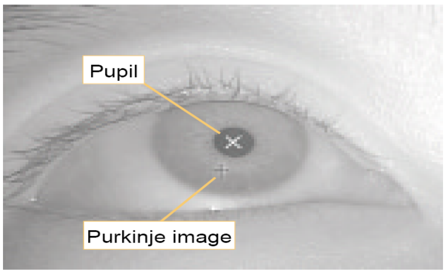

Fig. 1. Pupil and Purkinje image.

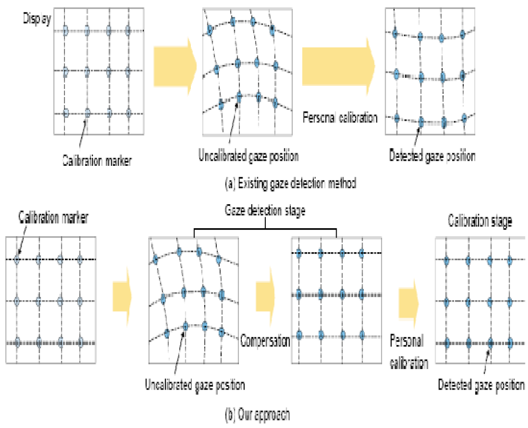

Fig. 2. Personal calibration method.

IV. Mouse Interface with Eye Gaze

Human input to computer systems is a critical and integral part of any human-computer interaction system. Input should also be designed as such, inseparable from the design of the output (display) components as well as the "interaction techniques" between input and output. This article focuses on the extreme end of input, but the reader is reminded that a good input device has to be compatible with the rest of the entire interactive system. The most common input device used today is the computer mouse.

There are various possible alternatives to the mouse, including touch screens, styli and tablets, joysticks, and trackballs. Various studies, such as have compared the relative merits of these devices. The consensus of that literature is that for interacting with graphical user interfaces (GUI) on desktop computers, the mouse serves most users quite well. The mouse is more direct and more natural than a trackball or a rate controlled joystick, but less fatiguing than touch screens operated by a finger or a stylus. The mouse also enables well-coordinated actions between movement of the cursor and the selection of an object by button clicks, which is a challenge for many other devices. The underlining technology for the mouse has evolved over many generations. Engel bart and his colleagues' mouse prototype with two wheels sensing the horizontal and vertical movements of the mouse respectively. One lasting successful design uses a rolling ball to drive two orthogonal optical encoders for two dimensional movements. Many design and manufacturing details, such as the size, weight, and location of the ball in the mouse body, affect the quality of use.

A mouse in fact is a digital computer in itself, equipped with a processor and firmware program that compute the x y displacement in "mickies" based on the number of impulses measured by the optical encoders. The mickies are periodically sent to a host computer in packets based on such standards as PS/2 mouse/keyboard protocol or the USB (Universal Serial Bus) Human Interface Device (HID) protocol. A more recent technological advancement is the use of a small, high frequency optical sensor (camera) embedded at the bottom of the mouse to measure the mouse's movement speed by image correlation. Such a solid state design without moving parts is not only less susceptible to dust and debris that tend to be picked up by a rolling ball, but also simpler in assembly popularity. Another problem with a stylus is that it, together with the user's hand, may obscure the very object the user needs to look at. This reminds us of a point made earlier – effective input has to be designed together with interaction techniques and output displays. Many of today's usability issues with pen-based interfaces have resulted from "transplanting" existing desktop GUI interfaces to mobile forms. There have been various successful designs of interaction techniques particularly suited for pen-based interactions. "Marking menus", which uses consistent pen gesture marks defined on nested pie menus that a novice can gesture by looking at the menu but an experienced user can gesture by recall, is one example

The "Shorthand Aided Rapid Keyboard" (SHARK) system accommodates novice and experienced users in a similar way: one can tap or trace letters on a graphical keyboard by looking at the keyboard, but a more experienced user can recall the same pattern from memory and simply write the pattern of a word, fully taking advantage of a pen.

It is expected that computers will take more input from sensors of various kinds. Some of these sensors will be likely integrated into the mouse. For example, a mouse can be made "touch sensitive", which can display or hide crowding GUI widgets depending on whether a user's hand is on the mouse. With sensors, computers will be able to take various contextual inputs, such as user presence, posture, physiological variables (heart rate, galvanic skin conductance, EMG etc), or eye-gaze. A critical research challenge is to make computer systems take appropriate actions based on these contextual inputs that help users to achieve their goals. For example, a user's eye-gaze has long been explored as a source of input. Two fundamental limitations have to be overcome in using eye-gaze for interaction appropriately. First, eye gaze accuracy is likely limited to one visual degree. Second, the eye, whose movement is driven both by the

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mind and by the scene, is not a natural control organ, in contrast with the hand. One approach to overcome these limitations is the MAGIC (Manual Acquisition with Gaze Initiated Cursor) system, which takes advantage of the eye-gaze information implicitly, without resolving to conscious and unnatural "eye control". When an input device is touched the mouse cursor appears at the location where the eye is gazing on the screen, hence reducing the need to make large movements by hand to move the cursor to that location on the screen.

V. Results

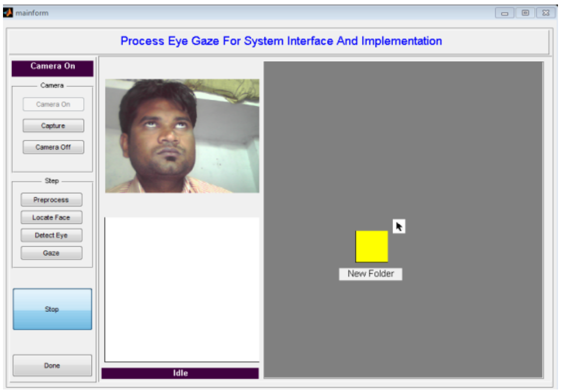

Fig.3. Image as input taken by webcam (upward)

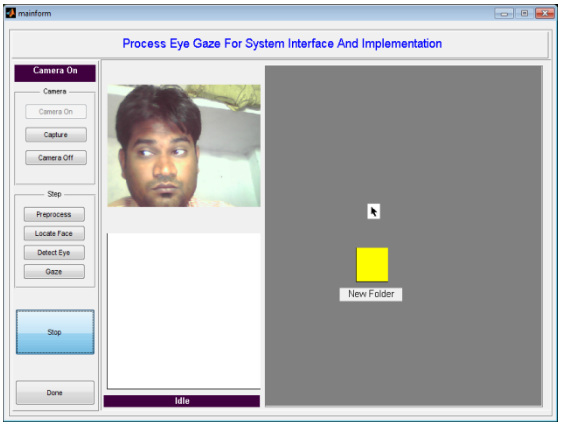

Fig.4. Movement of Curser in upward direction and camera take next image snap for next movement (left side)

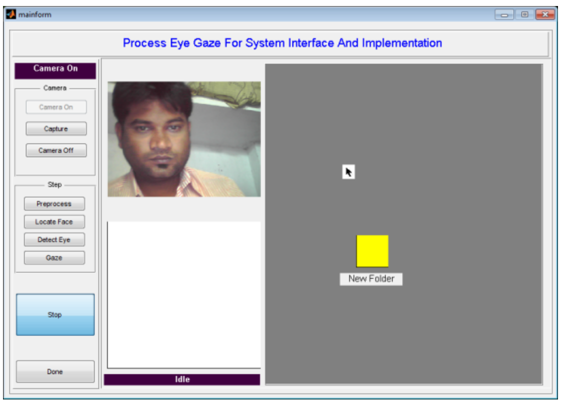

Fig.5. Movement of Curser in left side. And take next snap shot for further movement of curser

VI. Conclusion

Eye tracking can be a good strategy if it is combined with traditional techniques it helps to sell usability testing. The eye-tracking method results in a series of numbers. It provides a quantitative, "scientific" basis for evaluating user behaviour; traditional usability testing is often reproached to lack such a basis. Eye-gaze correction scheme represents a large step towards a viable video-teleconferencing system for the mass market; there are still plenty of rooms for improvements, especially in the stereo view matching stage.

References

[1] Kyung-Nam Kim & R. S. Ramakrishna, *Vision base Eye-Gaze tracking for human Computer interface*,IEEE computer society press, oct 2007

[2] Baosheng Hu & Minghua Qiu *"A New Method For Human computer Interaction By Using Eye Gaze"* 0-7803-2129-4194, 1994 IEEE, pp 2723-2728

[3] B. D. Mesh et al. | vision Research 44 *Spontaneous eye movements Tracking* 2004 pp 711-726.

[4] I. Akyildiz, *A Survey On Eye Gaze*, IEEE Computer Commun. Vol. 43, No. 9, Sep. 2005, Pp.S23-S30.

[5] Chang-Hee Lee, Wayne V. Sorin, "Gaze tracking for Multimodal human computer interface", *Journal Of Vision Technology*, Vol. 24, No. 12, Dec. 2006, Pp. 4568-4583.

[6] Eye Tracking Research & Applications Symposium 2000

[7] Bojko, A. (2005). Eye Tracking in User Experience Testing: How to Make the Most of It. *Proceedings of the 14th Annual Conference of the Usability Professionals Association (UPA).* Montréal, Canada

[8] Nguyen Huu Cuong, Huynh Thai Hoang , *Eye-Gaze Detection with a Single WebCAM Based on Geometry Features Extraction,* 11th Int. Conf. Control, Automation, Robotics and Vision Singapore, December 2010

[9] S. Amarnag, R. S. Kumaran and J. N. Gowdy, *"Real time eye tracking for human computer interfaces"*, Proceedings of the International Conference on Multimedia and Expo, Volume 3, July 2003, pp. 57-60.

[10] C. Harris and M. Stephens, *"A combined corner and edge detector"*, Proceedings of the 4th Alvey Vision Conference, 1988, pp. 147-151.

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