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Blue Eyes Technology

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Introduction

• The BLUE EYES technology aims at creating computational machines that have perceptual and sensory ability like those of human beings.

• It uses non-obtrusive sensing method, employing most modern video cameras and microphones to identify the users actions through the use of imparted sensory abilities.

• The machine can understand what a user wants, where he is looking at, and even realize his physical or emotional states.
The term BLUE EYES

- BLUE in the term stands for Bluetooth, which enables reliable wireless communication.

- EYES, because the eye movement enables us to obtain a lot of interesting and important information.
INPUTS USED

- Heart pulse rate
- Facial expressions: Eye brows and Mouth lines primarily
- Eye movements: As a pointing device and also to determine the emotion.
- Voice
AFFECTIVE COMPUTING

The process of making emotional computers with sensing abilities is known as affective computing.

Steps Include:-

- Giving Sensing Abilities
- Detecting human emotions.
- Respond properly.
METHODS

Affect Detection

- Detection of emotional states from facial expressions

- Most of the information is extracted from the position of the eye brows and the corners of the mouth.

- Then processed to arrive at the operator’s emotional state.
Emotion Mouse

Mouse is embedded with sensors that can sense the physiological attributes like:

- Temperature
- Body Pressure
- Pulse Rate
- Touching Style etc.

The computer determines the user’s emotional states from these inputs.
Emotion Mouse

- Rosalind Picard (1997) describes why emotions are important to the computing community.

- There are two aspects of affective computing: giving the computer the ability to detect emotions and giving the computer the ability to express emotions.

- Not only are emotions crucial for rational decision making as Picard describes, but emotion detection is an important step to an adaptive computer system.

- An adaptive, smart computer system has been driving our efforts to detect a person’s emotional state.
• An important element of incorporating emotion into computing is for productivity for a computer user.

• A study (Dryer & Horowitz, 1997) has shown that people with similar personalities collaborate well.

• By matching a person’s emotional state and the context of the expressed emotion, over a period of time the person’s personality is being exhibited.

• Therefore, by giving the computer a longitudinal understanding of the emotional state of its user, the computer could adapt a working style which fits with its user’s personality.
Manual and Gaze Input Cascaded (Magic) Pointing

- This work explores a new direction in utilizing eye gaze for computer input. Gaze tracking has long been considered as an alternative or potentially superior pointing method for computer input.

- Two specific MAGIC pointing techniques, one conservative and one liberal, were designed, analyzed, and implemented with an eye tracker.

- There are two fundamental shortcomings to the existing gaze pointing techniques, regardless of the maturity of eye tracking technology.
First, given the one-degree size of the fovea and the subconscious jittery motions that the eyes constantly produce, eye gaze is not precise enough to operate UI widgets such as scrollbars, hyperlinks, and slider handles.

Second, and perhaps more importantly, the eye, as one of our primary perceptual devices, has not evolved to be a control organ.
Gaze position reported by eye tracker

True target will be within the circle with 95% probability

Eyetracking boundary with 95% confidence

The cursor is warped to eye tracking position, which is on or near the true target

Previous cursor position, far from target (e.g., 200 pixels)

Figure 1. The liberal MAGIC pointing technique: cursor is placed in the vicinity of a target that the user fixates on.
Gaze position reported by eye tracker

True target will be within the circle with 95% probability

Eyetracking boundary with 95% confidence

The cursor is warped to the boundary of the gaze area, along the initial actuation vector

Initial manual actuation vector

Previous cursor position, far from target

Figure 2. The conservative MAGIC pointing technique with “intelligent offset”
The liberal and the conservative MAGIC pointing techniques offer the following potential advantages:

- Reduction of manual stress and fatigue, since the cross screen long-distance cursor movement is eliminated from manual control.

- Practical accuracy level. In comparison to traditional pure gaze pointing whose accuracy is fundamentally limited by the nature of eye movement, the MAGIC pointing techniques let the hand complete the pointing task, so they can be as accurate as any other manual input techniques.

- A more natural mental model for the user. The user does not have to be aware of the role of the eye gaze. To the user, pointing continues to be a manual task, with a cursor conveniently appearing where it needs to be.
The IBM Almaden Eye Tracker

- In comparison to the system reported in early studies, this system is much more compact and reliable.

- When the light source is placed on-axis with the camera optical axis, the camera is able to detect the light reflected from the interior of the eye, and the image of the pupil appears bright.

- This effect is often seen as the red-eye in flash photographs when the flash is close to the camera lens.
IBM Almaden eye tracker
work on The Bright Pupil Effect and The Dark Pupil Effect
Figure 3. Bright (left) and dark (right) pupil images resulting from on- and off-axis illumination. The glints, or corneal reflections, from the on- and off-axis light sources can be easily identified as the bright points in the iris.
Implementing Magic Pointing

- The MAGIC pointing program takes data from both the manual input device (of any type, such as a mouse) and the eye tracking system running either on the same machine or on another machine connected via serial port.

- Raw data from an eye tracker can not be directly used for gaze-based interaction, due to noise from image processing, eye movement jitters, and samples taken during saccade (ballistic eye movement) periods.
Experimental Design

- A standard mouse was first considered to be the manual input device in the experiment.

- Another device suitable for MAGIC pointing is a touchpad.

- Subjects were asked to point and click at targets appearing in random order.

- If the subject clicked off-target, a miss was logged but the trial continued until a target was clicked.
Figure 4. Experimental task: point at paired targets
The Simple User Interest Tracker

(SUITOR)

• By observing the Webpage a netizen is browsing, the SUITOR can help by fetching more information at his desktop.

• By simply noticing where the user’s eyes focus on the computer screen, the SUITOR can be more precise in determining his topic of interest.

• SUITOR knows where you are looking, what applications you are running, and what Web pages you may be browsing.
Conclusion

• The BLUE EYES technology ensures a convenient way of simplifying the life by providing more delicate and user friendly facilities in computing devices.

• Now that we have proven the method, the next step is to improve the hardware.

• Instead of using cumbersome modules to gather information about the user, it will be better to use smaller and less intrusive units.
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Thank You