BLUE EYES TECHNOLOGY

Swati

Assistant Professor, Dept of CS, C.R.M. JAT PG College
Hissar, Haryana (India)

ABSTRACT

The world of science cannot be measured in terms of development and progress. It has now reached to the technology known as "Blue eyes technology" that can sense and control human emotions and feelings through gadgets. The eyes, fingers, speech are the elements which help to sense the emotion level of human body. The basic idea behind this technology is to give the computer the human power. We all have some perceptual abilities. That is we can understand each other's feelings. For example we can understand ones emotional state by analyzing his facial expression. If we add these perceptual abilities of human to computers would enable computers to work together with human beings as intimate partners. The "BLUE EYES" technology aims at creating computational machines that have perceptual and sensory ability like those of human beings. This paper implements a new technique known as Emotion Sensory World of Blue eyes technology which identifies human emotions (sad.happy.exclted or surprised) using image processing techniques by extracting eye portion from the captured image which is then compared with stored images of data base.

Keywords : CSU (Central System Unit), DAU (Data Acquisition Unit) , Emotion Mouse, MAGIC (Manual And Gaze Input C), Simple User Interest Tracker (SUITOR).

I. INTRODUCTION

Imagine yourself in a world where humans interact with computers. It has the ability to gather information about you and interact with you through special techniques like facial recognition, speech recognition, etc. It can even understand your emotions at the touch of the mouse. It verifies your identity, feels your presents, and starts interacting with you .Human cognition depends primarily on the ability to perceive, interpret, and integrate audio-visuals and sensoring information. Adding extraordinary perceptual abilities to computers would enable computers to work together with human beings as intimate partners. Researchers are attempting to add more capabilities to computers that will allow them to interact like humans, recognize human presents, talk, listen, or even guess their feelings. 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 user's 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 BLUE EYES technology aims at creating computational machines that have perceptual and sensory ability like those of human beings. It uses non-obtrusige sensing method, employing most modern video cameras and microphones to identifies 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. In the name of BLUE EYES Blue in this term stands for Blue tooth (which enables wireless communication) and eyes because eye movement enables us to obtain a lot of interesting and information. Blue

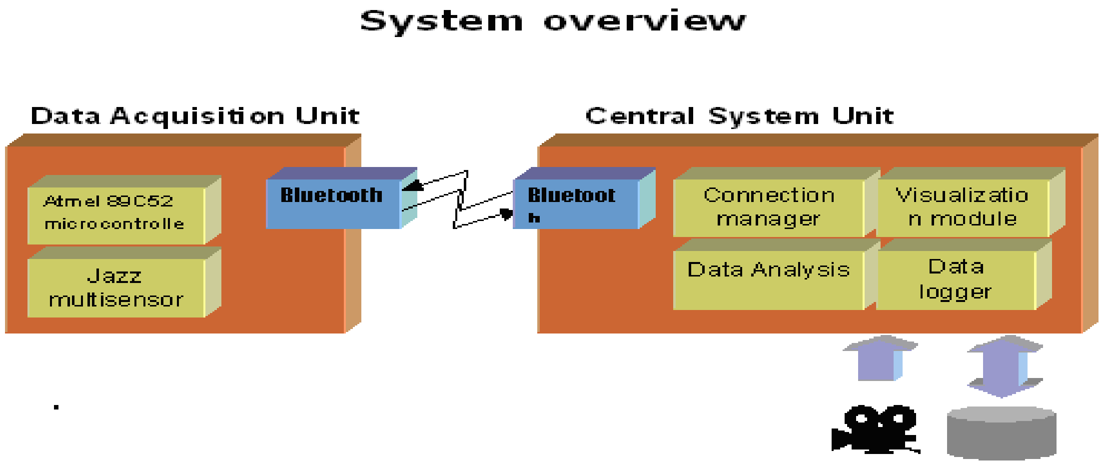
Eyes system consists of a mobile measuring device and a central and a central analytical system. The mobile device is integrated with Bluetooth module providing wireless interface between sensors worn by the operator and the central unit. ID cards assigned to each of the operators and adequate user profiles on the central unit side provide necessary data personalization so the system consists of

1.1 Data Acquisition Unit

Data Acquisition Unit is a mobile part of the Blue eyes system. Its main task is to fetch the physiological data from the sensor and send it to the central system to be processed. Data Acquisition Unit are to maintain Bluetooth connections to get information from sensor and sending it

1.2 Centarl System Unit

CSU maintains other side of the Blue tooth connection, buffers incoming sensor data, performs online data analysis records conclusion for further exploration and provides visualization interface.



II. EMOTION COMPUTING

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, but emotion detection is an important step to an adaptive computer system. 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 personalities that are similar or complement each other collaborate well. For these reasons, it is important to develop computers which can work well with its user.

2.1 Theory

Based on Paul Ekman’s facial expression work, we see a correlation between a person’s emotional state and a person’s physiological measurements. Selected works from Ekman and others on measuring facial behaviours describe Ekman’s Facial Action Coding System . One of his experiments involved participants attached to devices to record certain measurements including pulse, galvanic skin response (GSR),temperature ,somatic movement and blood pressure. He then recorded the measurements as the participants were instructed to mimic facial expressions which corresponded to the six basic emotions. He defined the six basic emotions as anger, fear, sadness, disgust, joy and surprise.

2.2 Result

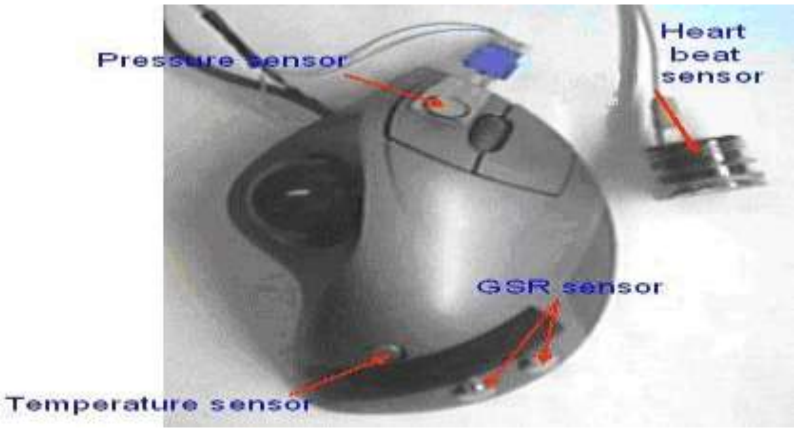
The data for each subject consisted of scores for four physiological assessments [GSA, GSR, pulse, and skin temperature, for each of the six emotions (anger, disgust, fear, happiness, sadness, and surprise)] across the five minute baseline and test sessions. GSA data was sampled 80 times per second, GSR and temperature were reported approximately 3-4 times per second and pulse was recorded as a beat was detected, approximately 1time per second. To account for individual variance in physiology, we calculated the difference between the baseline and test scores. Scores that differed by more than one and a half standard deviations from the mean were treated as missing. By this criterion, twelve score were removed from the analysis. The results show the theory behind the Emotion mouse work is fundamentally sound.

III. TYPES OF EMOTION SENSORS

3.1 For Hand

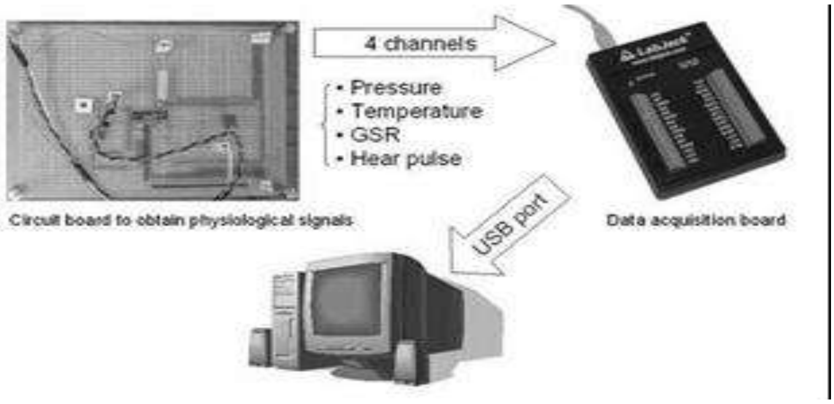
3.1.1 Emotion Mouse

One goal of human computer interaction (HCI) is to make an adaptive, smart computer system. This type of project could possibly include gesture recognition, facial recognition, eye tracking, speech
recognition, etc.



Emotional Mouse

Another non-invasive way to obtain information about a person is through touch. People use their computers to obtain, store and manipulate data using their computer. In order to start creating smart computers, the computer must start gaining information about the user. Our proposed method for gaining user information through touch is via a computer input device, the mouse.



System Configuration for Emotional Mouse

From the physiological data obtained from the user, an emotional state may be determined which would then be related to the task the user is currently doing on the computer. Over a period of time, a user model will be built in order to gain a sense of the user's personality. The scope of the project is to have the computer adapt to the user in order to create a better working environment where the user is more productive.

3.1.2 Sentic Mouse

The Sentic Mouse is an experiment inspired by the work of Peter J. Lang, Ward Winton, Lois Putnam, Robert Kraus and Dr. Manfred Clynes, that provides a first step toward designing a tool to measure a subject's emotional valence response. The goal of the experiment is to begin to apply quantifying values to emotions and ultimately to build a predictive model for emotion theory. Peter J. Lang and others showed subjects a series of pictures and asked them to self-rate their emotional response. Dr. Manfred Clynes conducted a series of sentic experiments, gathering data from the vertical and horizontal components of

Sentic Mouse

finger pressure. Under the auspices of the Affective Computing research group, these three models were applied to the interaction between humans and computers. Using a computer to provide the affective stimulus to the human subject, an experiment was conducted which combined all three emotion studies. An ordinary computer mouse was augmented with a pressure sensor to collect sentic data as in Dr. Clynes experiments.The three measured results: sentic data, heart rate, and self-assessment, were then readily compared against each other as well as against the theoretically predicted results to assess the subject's emotional valence for each slide.

3.2. For Eyes

3.2.1 Expression Glasses

Expression Glasses provide a wearable "appliance-based" alternative to general-purpose machine vision face recognition systems. The glasses sense facial muscle movements, and use pattern recognition to identify meaningful expressions such as confusion or interest.

Expression Glasses

A prototype of the glasses has been built and evaluated. The prototype uses piezoelectric sensors hidden in a visor extension to a pair of glasses, providing for compactness, user control, and anonymity.

3.2.2 Manual and Gaze Input Cascaded (Magic) Pointing

We propose an alternative approach, dubbed MAGIC (Manual And Gaze Input C) as caded pointing. With such an approach, pointing appears to the user to be a manual task, used for fine manipulation and selection. However, a large portion of the cursor movement is eliminated by warping the cursor to the eye gaze area, which encompasses the target. Two specific MAGIC pointing techniques, one conservative and one liberal, were designed, analyzed, and implemented with an eye tracker we developed. They were then tested in a pilot study.

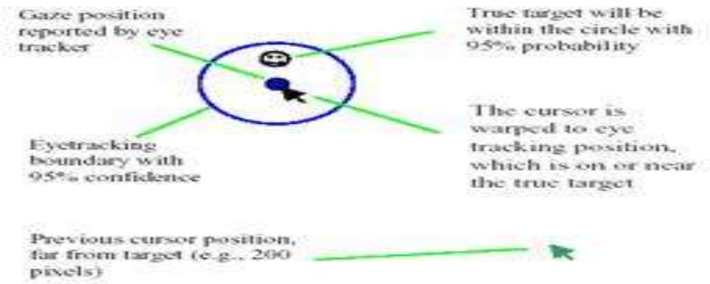


Figure 1. The liberal MAGIC pointing technique: cursor is placed in the vicinity of a target that the user fixates on.

The user can then take control of the cursor by hand near (or on) the target, or ignore it and search for the next target. Operationally, a new object is defined by sufficient distance (e.g., 120 pixels) from the current cursor position, unless the cursor is in a controlled motion by hand. Since there is a 120-pixel threshold, the cursor will not be warped when the user does continuous manipulation such as drawing. Note that this MAGIC pointing technique is different from traditional eye gaze control, where the user uses his eye to point at targets either without a cursor or with a cursor that constantly follows the jittery eye gaze motion. Once the manual input device has been actuated, the cursor is warped to the gaze area reported by the eye tracker. This area should be on or in the vicinity of the target.

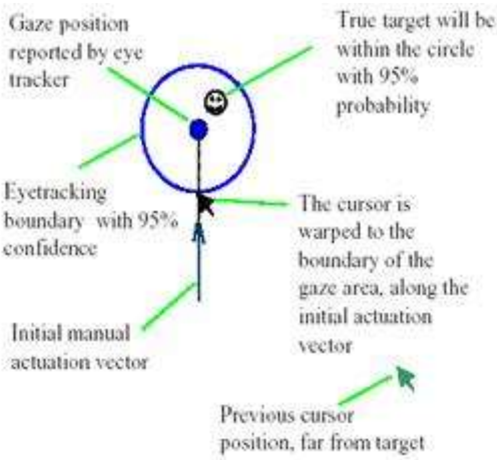


Figure 2. The conservative MAGIC pointing technique with "intelligent offset"

Both the liberal and the conservative MAGIC pointing techniques offer the following potential advantages

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

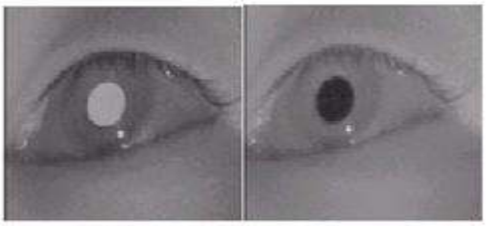
2. Practical accuracy level. In comparison to traditional pure gaze pointing whose accuracy is fundamentally limited by the nature of eye movement, the MAGIC pointing techniques let the hand complete the pointing task, so they can be as accurate as any other manual input techniques.

3. A more natural mental model for the user. The user does not have to be aware of the role of the eye gaze.

4. Speed. Since the need for large magnitude pointing operations is less than with pure manual cursor control, it is possible that MAGIC pointing will be faster than pure manual pointing.

3.2.3 The Ibm Almaden Eye Tracker

Since the goal of this work is to explore MAGIC pointing as a user interface technique,



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.

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. 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. The Almaden system uses two near infrared (IR) time multiplexed light sources, composed of two sets of IR LED's, which were synchronized with the camera frame rate. One light source is placed very close to the camera's optical axis and is synchronized with the even frames. Odd frames are synchronized with the second light source, positioned off axis. The two light sources are calibrated to provide approximately equivalent whole-scene illumination.

3.3. For Voice

3.3.1 Artificial Intelligent Speech Recognition

It is important to consider the environment in which the speech recognition system has to work. The grammar used by the speaker and accepted by the system, noise level, noise type, position of the microphone, and speed and manner of the user's speech are some factors that may affect the quality of speech recognition. The user speaks to the computer through a microphone, which, in used; a simple system may contain a minimum of three filters. The more the number of filters used, the higher the probability of accurate recognition. Presently, switched capacitor digital filters are used because these can be custom-built in integrated circuit form. These are smaller and cheaper than active filters using operational amplifiers. The filter output is then fed to the ADC to translate the analogue signal into digital word. The ADC samples the filter outputs many times a second. Each sample represents different amplitude of the signal . Each value is then converted to a binary number proportional to the amplitude of the sample. A central processor unit (CPU) controls the input circuits that are fed by the ADCS. A large RAM (random access memory) stores all the digital values in a buffer area. This digital information, representing the spoken word, is now accessed by the CPU to process it further. The normal speech has a frequency range of 200 Hz to 7 kHz. Recognizing a telephone call is more difficult as it has bandwidth limitation of 300 Hz to3.3 kHz.

IV. THE SIMPLE USER INTEREST TRACKER (SUITOR)

Computers would have been much more powerful, had they gained perceptual and sensory abilities of the living beings on the earth. What needs to be developed is an intimate relationship between the computer and the humans. And the Simple User Interest Tracker (SUITOR) is a revolutionary approach in this direction. By observing the Webpage at 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. It can even deliver relevant information to a handheld device. IBM's Blue Eyes research project began with a simple question, according to Myron Flickner, a manager in Almaden's USER group: Can we exploit nonverbal cues to create more effective user interfaces? One such cue is gaze the direction in which a person is looking. Flickner and his colleagues have created some new techniques for tracking a person's eyes and have incorporated this gaze-tracking technology into two prototypes. One, called SUITOR (Simple User Interest Tracker), fills a scrolling ticker on a computer screen with information related to the user's current task. SUITOR knows where you are looking, what applications you are running, and what Web pages you may be browsing. "If I'm reading a Web page about IBM, for instance," says Paul Maglio, the Almaden cognitive scientist who invented SUITOR, "the system presents the latest stock price or business news stories that could affect IBM.

V. APPLICATIONS

The following are the applications of the Blue Eyes System.

1. At power point control rooms.
2. At Captain Bridges
3. At Flight Control Centers
4. Professional Drivers

VI. CONCLUSION

The Blue Eyes system is developed because of the need for a real-time monitoring system for a human operator. The approach is innovative since it helps supervise the operator not the process, as it is in presently available solutions. We hope the system in its commercial release will help avoid potential threats resulting from human errors, such as weariness, oversight, tiredness or temporal indisposition. The use of a miniature CMOS camera integrated into the eye movement sensor will enable the system to calculate the point of gaze and observe what the operator is actually looking at. Introducing voice recognition algorithm will facilitate the communication between the operator and the central system and simplify authorization process. Despite considering in the report only the operators working in control rooms, our solution may well be applied to everyday life situations. These new possibilities can cover areas such as industry, transportation, military command centres or operation theatres. Researchers are attempting to add more capabilities to computers that will allow them to interact like humans, recognize human presents, talk, listen, or even guess their feelings. Blue Eyes emphasizes the foundations of the project – Bluetooth technology and the movements of the eyes. Bluetooth provides reliable wireless communication whereas the eye movements enable us to obtain a lot of interesting and important information.

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