Computer Interface with the Help of Eye

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ABSTRACT
This paper presents an implementation of the “Eye Tracking Mouse”, the arrangements has been established to make the border between the disable person and the system. As we know that the computer provides various potential application such as monitoring the system but the person with the severe disability is not able to access the computer or the benefits that are provided by the computer. Aim of this system is that it tracks the computer operator’s activities with the help of the camera and translates them into the arrangements of the mouse cursor on the display. The different body parts like the tip of the user’s nose, head movements, eye movement, voice recognition are helpful to operate the system. The object of this paper is to present a set of methods integrated into a low-lost eye tracking system. Here we are going to study how we access the system with the help of “eye mouse”. Eye mouse helps disable person to access the system. This method consist of various steps like Face detection, Eye detection, Template generating, Template matching, Fine-tuning, Mouse control. With the help of these steps direction of eye movement are developed after that the movements are useful to manipulate the computer. This article focus on computer interface which allows people with severe disabilities to use their eye to access computers and communicate with other persons.
1. INTRODUCTION

As we know that day by day the computers have been dramatically changing our lifestyles, livelihoods, and even the whole society. Human-system (computer) communication has become an increasingly important part of our daily lives. Every morning starts with sending, receiving the emails and all, that doesn’t mean it is only helpful to our lives, at the same time it creates the disturbance in our life that means the person with the physical incapacities was not able to access the system manually like normal human beings, to provide the platform to such people now a day an alternative method is introduced.

Assistive technology system helps to allow the people with disabilities to use their various body parts like eye, head movement, voice to access the computer and communicate with family and friends. For some people with severe disabilities they can use their facial muscles. In case of extreme disability many available popular techniques are not helpful to them. Under this situation, eye movement based systems may provide an alternative option for people with severe disabilities who have the ability to move their eyes.

This article focuses on the various terms of digital image processing like pattern recognition, segmentation, methods, techniques etc. The work of system monitoring will be done by using image processing in MATLAB software.

A. SEGMENTATION:

It is the process in which the image is divided into different parts. As the process of segmentation is one of the most exciting works in image processing. The rugged segmentation technique carries the development to successful solution of imaging difficulties that require objects to be identified individually. Instead, weak or erratic segmentation processes almost guarantee eventual failure. Hence segmentation is powerful process in image processing.

B. RECOGNITION:

Recognition is the process that assigns a label (e.g., “eye”) to an object based on its descriptors. Here we can conclude our analysis with the development of methods for identification of individual objects. The process of pattern recognition is used for the pattern matching recognition technique.

2. DISABILITIES

The term disability means that it is a kind of disorder in which the people can not behave like a normal human being. A person can read, write, play, but in case of disability person are not able to use their body parts (eg- hands) but as we know that our hand plays a vital role for accessing the system. In such cases to provide an access of system we introduced the alternative for those people. If we consider the example that, a person is working in an organization as a computer operator after some days he met with an accident and he lost his hands, in such cases the employee have to lost the job but with the help of this application the disable person are also able to access the device like normal human being. As we can say that this application provide the platform to the handicapped person.

3. EYE TRACKING SYSTEM

A. Face Detection:

The objective of the eye-tracking system is used to locate the eyes of the user from a single image and then use the location information to manipulate the computer, for that purpose we take the generalized image (face). Face detection system introduced in [20-26]. Various face detection techniques are given such as RGB, HSV, and YCbCr. Here we are moving ahead with the help of YCbCr based skin color detection method [26]. Where Y is the luminance component, Cr and Cb are color difference signals, represent the chrominance component of the image.

In the survey of this article it was found that Chai and Ngan found the ranges, 125 ≤ Cr ≤ 165 and 77 ≤ Cb ≤ 127, which match to skin color [26]. At the early stage, an efficient face detection is carried out, that is taken from the low-cost web camera, after that we required the morphological filter. Then a simple segmentation method is applied to find the position of the eyes.
Fig 1: Steps of the face detection [5]

Fig 2: Camera is mounted on the computer [5]

Fig 3: Image captured by camera [6]
Eye Detection:

As we know that there are several different ways to find the position of eyes [16-19] and each have its certain advantages and disadvantages. Now we are going to use the very coolest method, in the survey, it is observed that the iris or pupils are darker than the neighbouring regions because there are large variations in the luminance components.

With the help of this method, we can transform the color image into a gray level image. The pixel whose gray level is below 55 then it can be considered as eye pixel [fig. 1(e)]. Here we are going to use the pattern matching method to locate the eye block in the sequential images. Once the image is captured it can be used for the future work if same person is going to use the system again and again but if the new operator is going to operate the computer then he have to repeat all the steps from the face detection. Finally the calculated direction information of eye movements is used to deploy the computer.

4. Literature Review

Margrit Betke [1] have proposed the assistive technology systems that use switches to control a computer [7] for entering text and other data into a computer. Current research in this area focuses on adapting matrix row and column scan delays in order to increase the individual user’s text entry rate without complicating the visual display [8]. The problem with this system is that it is difficult to operate.

Chen et al. developed a system which consist of infrared transmitter, mounted onto the user’s eye glasses which uses the tongue-touch panel to activate the infrared beam [9]. The drawback with this system is that the Helmets, electrodes, goggles, and mouth sticks are painful to wear or use, it is also necessary that the user have to keep his head completely steady and it requires full concentration on work. It is very expensive.

Samah Ramadan & Christopher E. Smith [2] undergo the study of vision based user interface, people can interact with computers by pointing with their eyes [10]. Visual attention can also inferred from analysis of eye movements. When we scan the visual scene, our eyes alternate between rapid jumps (i.e. “saccades”) and brief stop (or “fixation”). Although little information is processed during saccadic movement. Eye fixations enable us to focus our attention like spotlight. Therefore one way of exploring what people pay attention in any given situation is to use a computerized eye tracking system to record their visual attention strategies and the location and duration of their fixations. This can be used for example to determine visual attention of vehicle operator.

Anthony J. Honof [3] observed that the children improve their skills with read and write by using paper and pencil [13,11]. In the previous research it realized that the handicapped people can also draw with the help of their eyes. This process is very exciting because eye movement data are noisy and difficult to understand [12]. The difficulty with this system is that it is expensive.

Chinyen et al. [4] introduced the system which is based on the blinking of eye [14], it gives good result but it is also observed that if the time is out of date then there may be chances of generating the defective output by the system. Bhaskar et al. [15] studied on the
Blink Link and he have to face certain issue like the system requires the offline training and if the the position of the camera changes then it is necessary to reset the camera.

Mu-Chun Su et al. [5] proposed a voice-controlled human computer interface. As the voice controlled device have many advantages but at the same time the major disadvantage is that it is not accessible to the non-speaking people. In the case of “Head Mouse” the disable person can access the system with the help of head movement, but the movement of head creates the barrier in the process of accessing the device. It is also expensive. Under this situation, eye tracking system may provide the best alternative for people.

5. PROPOSED METHODOLOGY

The approach in this paper focuses on the various methods of image processing, pattern recognition and various algorithms to be applied to the eye tracking system. Theoretically this system is based on the video cameras as well as human-computer interface system. The system also consist of recognition template. Image processing tasks utilized in the system are image filtering and segmentation, tracking and identification, morphological filter, geometrical and statistical methods.

To have an easy and faster way for the user on the system to access the data of interest and needs, we propose a plan that not only supports to the disable person but also provide the platform to the user at low cost. This methodology will follow the same sequential phases of Eye Tracking System.

The flow of proposed methodology is given as follows:

1. Face detection
2. Eye detection
3. Template generating
4. Template matching
5. Fine-tuning
6. Mouse control

As we are working with the eye tracking, we deal with the eye that means the pupils of eye. Pupils are usually darker than their neighbouring regions (iris) for that purpose we take the generalized form (face), the face consist of head, eyes, nose, mouth. Apart from all we start our journey with eye and skip the other portion of the face. From the eye we work on the pupils to find the cursor control.

5. CONCLUSION

Eye Tracking System plays a vital role in improving the usability of the system. It also provides the support or platform to the disable person to access the device like a normal human being. In this paper we focused on the process of face detection, eye detection, at the same time we have also gone through the various methods and techniques to access the system like head movement, nose tip, voice recognition. But every method have its certain advantages and disadvantages, apart from all eye tracking system is one of the best method to access the device in very easy format and at low cost.

As the advances in the computer system is taking place day by day, hence we could think on providing the access to the handicapped people and connect them to the real world. We will work on template generating, template matching and cursor movement. Finally with the help of cursor movement we can make the interface between the system and user for which the proposed plan is to be introduced.

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