ISSN 2395-1621

Controlling Computer Function Using Face & Eye Tracking

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ABSTRACT

The paper present this system is a human computer interface for mouse operations using face. System serves as an intermediate block between the users and computer. It will capture the desired feature with a RGB Camera and monitor its action in order to translate it to some events that communicate with the computer. While different devices were used in HCI (e.g. infrared cameras, sensors, Microphones) we used an off-the-shelf RGB Camera that affords a moderate resolution and frame rate as the capturing device in order to make the ability of using the program affordable for all individuals.

Keywords: **RGB Camera, HCI, Sensors, SVM, Face detection.**

ARTICLE INFO

Article History

Received: 24th May 2016

Received in revised form : 24th May 2016

Accepted: 28th May 2016

Published online : 29th May 2016

I. INTRODUCTION

Gestures are a powerful means of communication among humans. In fact, gesturing is so deeply rooted in our communication that people often continue gesturing when speaking on the telephone. Hand gestures provide a separate complementary modality to speech for expressing ones ideas. Difference images are used to detect moving objects, which are then analyzed and the probability of a pointing posture and its direction is calculated. Intersecting the pointing ray with a virtual and normalized representation of the display canvas triggers the respective visual feedback or selection events. Smoothing of the tracking results using smoothing spline to reduce jittering effects leads to an immersive experience during the interaction without the need of any technical device. The tracking system is nearly self-calibrating. Only a few parameters like the dimensions of the regions of interest in the images and a segmentation threshold have to be set or adapted during and after the installation of the system. Furthermore a simple graphical interface ensures the easiest handling of the tracking application.

Hand gesture recognition in computer vision is an extensive area of research that encompasses anything from static pose estimation of the human hand to dynamic movements such as the recognition of sign languages. The demands on the tracking software used for this application arise from the scenario itself. In a public place such as a museum, a wide range of different visitors will use the system.

Therefore, it is necessary to have a tracking system at hand that is able to handle the interaction of different users, no matter if they are left- or right-handed, if they use just the index finger for pointing or even the opened hand. Furthermore, it is obvious that the tracking system has to be usable without a visitor specific training phase. A museum visitor should directly be able to interact with the exhibit without reading operating instructions first. A combination of basic different computer-vision and image processing algorithms is used to ensure a fast and robust identification of the eventually existing pointing gesture. The approach is based on the recognition of the human fingertip. This paper concept useful for physical challenge people.

II. LITERATURE SURVEY

[1] Hand Gesture Recognition Using Hidden Markov Models, Byung-Woo Min, Ho-Sub Yoon, Jung Soh, Yun-Mo Yangc'), and Toskiaki EjimaU

Here in this paper implemented, hand gesture is a form of visual communication among people. The use of hand gestures in man-machine interaction has attracted new interest in recent years. Most researchers in man-machine interaction area agreed that vocal language, gestures and facial expressions must be integrated for realizing more natural man-machine interface and defines it as a multi-modal interface. Recently research in hand gesture recognition aims at applying to sign language recognition, control of household

electronic appliances, human-computer interaction, VR, and so on. Our research is intended to develop a graphic editor system operated by hand gestures. The gestures are classified into two types. One is the static gestures which are one, two, three, four, and five in Korean sign language as shown in Figure 1.The other is the dynamic gestures which are six drawing elements such as circle, triangle, rectangle, arc, horizontal line, vertical line, and six edit commands such as move, copy, undo, swap, remove, close a s shown in Figure 1.

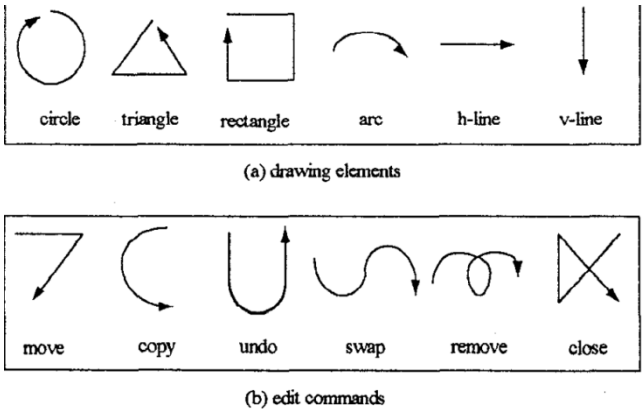

Fig 1. Dynamic Hand Gestures

Recognition is done using a structural analysis for static gestures and HMM for dynamic gestures. In this paper we mainly discuss the recognition of dynamic gestures by HMM.

[2] Design & development of color matching algorithm for Image retrieval using histogram and segmentation techniques, Krishna Kumar Pandey & Nishchol Mishra

The color image processing techniques applicable to color images, they are far from being exhaustive, color images are handled for a variety of image processing tasks. The color image processing sub divide into three principal areas:

Color transformations also called color mapping. spatial processing of individual color planes and color vectors processing. The first category deals with processing the pixels of each color plane based strictly o n their values and not on their spatial coordinates. This category is analogous to the material in dealing with intensity transformations. The second category deals with spatial (neighborhood) filtering of individual color planes and is analogous to the spatial filtering. The third category deals with techniques based on processing all components of a color image simultaneously. Because full-color images have at least three components, color pixels can be treated as vectors. For example, in the RGB system, each color point can be interpreted as a vector extending from the origin to that point in the RGB coordinate system. Color representation is based on the classical theory of Thomas Young (1802). The study of color is important in the design and development of color vision systems. Use of color in image displays is not only more pleasing, but it also enables us to receive more visual information. While we can perceive only a few dozen gray levels, we have the ability to distinguish between thousands of colors. The perceptual attributes of color are brightness, hue, and saturation. Brightness represents the perceived luminance. The hue of a color refers to its “redness”, “greenness”, and so on. For monochromatic light sources, differences in hues are manifested by the differences in wavelengths. saturations that aspect of perception that varies most strongly as more and more while light is added to a monochromatic light. These definitions are somewhat imprecise because hue, saturation, and brightness all change when the wavelength, the intensity, the hue, or the amount of white light in a color is changed.

[3] Gesture-based Computer Control System applied to the Interactive Whiteboard, Michal Lech, Bozena Kostek

Among human-computer interfaces that recently have gained much interest, gesture recognition systems can be mentioned. Various solutions provide not only recognition of forearm and palm gestures but also recognition of lip [1], head or eye movements and body poses (e.g. Natal project) .

However, main attention is still devoted to hand gesture recognition. The best recognition accuracy can be achieved using motion sensors (e.g. Data gloves) but from the point of view of user's convenience the most promising solutions are vision-based. Majority of such solutions use a camera placed in front of a user. In the paper a vision-based gesture recognition system which employs a camera and a projector, both placed behind the user, is first presented. Then the concept of using fuzzy logic for reliable gesture recognition is proposed (Section 3.2). Section 4 presents the interactive Whiteboard application engineered to demonstrate possibilities of the developed.

[4] A Method of Dynamic Hand Gesture Detection Based on Local Background, Shuying Zhao, Li Shena, Wenjun Tan

In aspect of dynamic hand gesture detection, interference objects, and computing speed is improved through Keywords-dynamic hand gesture detection; local background local background updates. The experimental results show that method is easy to operate and the most common method of model is proposed in this paper, foreground regions of moving object detection. moving object detection are optical flow method, frame moving objects, needs not to know any information of the Northeastern University objects including human hand. This model needs to compute often disconnected fragments when detects the objects that Optical flow method can detect out independently regions often exist when the traditional background scene in advance. But optical flow method computes Shenyang Liaoning, 110004, China Shuying Zhao slow computing speed and so on. A method of dynamic hand surface is smooth and move slowly. Background difference The process of hand gesture feature detection includes the whole image, thus computing time may be long . Aim this method can preferably detect out motion hand gestures to detect out the motion information contained in hand Updates and Skin Color Model.

III. PROPOSED SYSTEM

Modules:

In this project there are three modules

A. RGB Camera connectivity
B. Face detection or face recognition
C. Operation perform module i.e. image processing module.

RGB Camera connectivity:

i. In this module we connect RGB Camera to the machine

ii. Some cases there are many RGB Camera then we select particular RGB Camera which is support to our application.
iii. We set the RGB Camera properties in jmf tool.

Face detection:

i. In this module we perform face detection system i.e. we read images from RGB Camera and give input to the system.
ii. Jmf transfer all images to our application as a input.
iii. We display all objects by the selecting area on the face i.e eye, nose etc.

Operation perform module:

i. We perform operation which is done physical mouse.
ii. We can select any file using eyes and nose.
iii. All mouse operation done using our application.

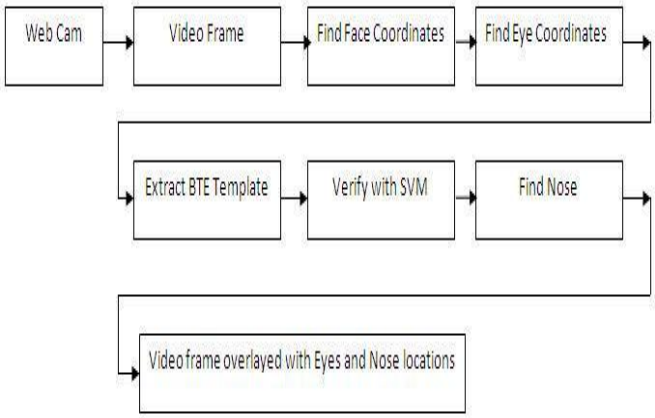

Fig 2. System architecture

IV. ALGORITHM USED

Face Detection

Two different methods were implemented in the project. They are:

1. Continuously Adaptive Means-Shift Algorithm
2. Haar Face Detection method

Continuously Adaptive Mean-Shift Algorithm:

Adaptive Mean Shift algorithm is used for tracking human faces and is based on robust non-parametric technique for climbing density gradients to find the mode (peak) of probability distributions called the mean shift algorithm. As faces are tracked in video sequences, mean shift algorithm is modified to deal with the problem of dynamically changing color probability distributions. The block diagram of the algorithm is given below:

Haar-Face Detection Method

The second face detection algorithm is based on a classifier working with Haar-Like features (namely a cascade of boosted classifiers working with Haar-like features). First of all it is trained with a few hundreds of sample views of a face. After a classifier is trained, it can be applied to a region of interest in an input image. The classifier outputs a "1" if the region is likely to show face and "0" otherwise. To search for the object in the whole image, one can move the search window across the image and check every location using the classifier. The classifier is designed so that it can be easily "resized" in order to be able to find the objects of interest at different sizes, which is more efficient than resizing the image itself.

Eye Detection

Two different methods were implemented in the project:

a) Template-Matching

b) Adaptive EigenEye Method

Template-Matching

Template-Matching is a well-known method for object detection. In our template matching method, a standard eye pattern is created manually and given an input image, the correlation values with the standard patterns are computed for the eyes. The existence of an eye is determined based on the correlation values. This approach has the advantage of being simple to implement. However, it may sometimes be inadequate for eye detection since it cannot effectively deal with variation in scale, pose and shape.

Adaptive EigenEye Method

Adaptive EigenEye Method is based on the well-known method EigenFaces. However as the method is used for eye detection we named it as “EigenEye Method”. The main idea is to decompose eye images into a small set of characteristics feature images called eigeneyes, which may be thought of as the principal components of the original images. These eigeneyes function as the orthogonal basis vectors of a subspace called eyespace. However we know that the eigenface method is not scale invariant. To provide the scale invariance we can resize the eye-database once with the information gathered by the face detection algorithm (EyeWidth / FaceWidth ? 0.35), we can provide scale-invariant detection using only one database.

V. CONCLUSION

“Controlling Computer Function Using Face & Eye Tracking” is boon for the disable people who are not able to use physical mouse properly. It will gives them a new way to interact with computer world. It opens a new era in computer technology. It is efficient in real time applications which give speed and accuracy of the system. This is useful for physical challenge people.

ACKNOWLEDGMENT

We would like to thank our guide also for her guidelines in making this paper.

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