ABSTRACT

In existing system we performing mouse for performing the task of mouse events handling like select, click etc are done by the hardware mouse. The mouse is handheld device that has to be operated by the user for performing the task. While performing task the mouse location defines the cursor position on the screen. Sometimes the mouse is not suitable to be handled by physically disabled people. Also handling mouse operation using hand are time consuming than done mouse operation by eye tracking technology. The paper presents the real time system interface between computer and human. This technology is able to replace the traditional mouse with the human face as a new way to interact with computer. The system we described is fast and affordable technique for tracking facial features. By using Six-Segment –Rectangular (SSR)filter, Integral Image and SVM for recognizing the facial features. This system can run at the speed of 30 frames/sec.

Index Terms: Face detection, SSR filter, Integral Image, SVM algorithm, Webcam.

I. INTRODUCTION

The main objective of this paper is to replace the traditional mouse with the human face as a new way to interact with computer. Human face is a dynamic object; it has a high degree of variability and various techniques have been proposed previously. This technology is intended to be used by physically handicapped/Disabled people who are suffering from a lot of problems in communicating with computer. This technology will help disabled people to communicate through their voluntary movements like eyes and nose movements. This system uses inbuilt camera or USB camera to capture or detect the user's face movements. The proposed algorithm tracks the movements of eyes and nose accurately to control the cursor, thus providing an alternative way to access computer mouse.

A. Face Detection

In the recent few years very large amount of research being carried out in the field of face detection. Face detection is a vast research in the computer world. Face detection techniques are classified into two categories: Feature-based Approach and Image-based Approach.

1. Feature-based Approach

In Feature-based Approach we find the facial features (e.g. Nose, eyes etc.) and verify their performance by examining locations and distance from each other. Feature-based Approach can achieve high speed in face detection. Basically it is known for is pixel accuracy and speed.

2. Image-based Approach
This approach scans the image of interest with a window that looks for faces at all the scales and locations. By Hjelman's survey the window scanning algorithm is in essence just an exhaustive search of the input images for possible face locations at all scales.

B. SSR FILTER

At the beginning, a rectangle is scanned throughout the input image [4]. This rectangle is divided into six segments as shown in fig 1.

![SSR Filter Diagram](image)

**Figure 1: SSR Filter**

The proposed SSR filter is used to detect the Between-the-eyes [BTE] based on two characteristics of face geometry.

i. The nose area is brighter than the right and left eye area.

ii. The eye area (eyes and eyebrows) is relatively darker than the cheekbone area.

When these i and ii characteristics are satisfied, the center of the rectangle can be a candidate for Between-the-eye.

C. Integral Image

The SSR filter is computed by using intermediate representation for image called as "integral image".

D. Support Vector Machine

SVM is a maximum margin classifier: In "learning theory" there is a theorem stating that in order to achieve minimal classification error the hyper plane which separates positive samples from negative ones should be with the maximum margin of the training sample and this is what the SVM is all about. The Samples of data that are closest to the hyper plane are called support vector [4],[7]. The hyper plane is defined by balancing its distance between positive and negative support vectors in order to get the maximum margin of the training data set.

II. LITERATURE SURVEY

[1] Eye-Gaze Tracking Research Based on Image Processing

**Description:** This paper presents an eye-gaze tracking system based on the image processing. All the computations are performed in software and the system just needs a PC camera attached to the user's computer. We first extract the facial regions form the images using the skin-color model and connected-component analysis. Then the eye regions are detected by employing the rules and area segmentation. After the detection of eye movements, the tracking is performed using the mean-shift algorithms. The
experimental results verify the feasibility and validity of the proposed eye-gaze tracking system, while there is still room for the improvement to be made.

[2] Recognition of Eye States in Real Time Video

Description: A composite algorithm is proposed to identify the opened and shut states of eye in real-time video. Sequentially, each frame of the video is processed first to find and separate the eye regions; then, the accumulation array of circular Hough transform is applied for detecting circles to recognize the opened state of the eye, and the upper eyelid curve is calculated to identify its bending direction to recognize the shut state; after that, if the state cannot be determined yet, judging by the standard deviation of distance between eyelids, the eye state of blinking is determined finally. An accuracy of 94% for eye state detection is obtained in our experiments by using the proposed algorithm. As an important part, the algorithm is going to be utilized in a fatigue warning system for drivers.


Description: We present a real-time liveness detection approach against photograph spoofing in face recognition, by recognizing spontaneous eye blinks, which is a non-intrusive manner. The approach requires no extra hardware except for a generic web camera. Eye blink sequences often have a complex underlying structure. We formulate blink detection as inference in an undirected conditional graphical framework, and are able to learn a compact and efficient observation and transition potentials from data. For purpose of quick and accurate recognition of the blink behavior, eye closity, an easily-computed discriminative measure derived from the adaptive boosting algorithm, is developed, and then smoothly embedded into the conditional model. An extensive set of experiments are presented to show effectiveness of our approach and how it outperforms the cascaded Adaboost and HMM in task of eye blink detection.

III. PROPOSED ALGORITHM

In this System capture the desired feature with a webcam and monitor its action in order to translate it to some events that communicate with the computer. It is unlike the Hardware mouse. The main objective of the project is to replace physical mouse. The face is detected in real time and tracked down so that the face movements will become the mouse movements. To simulate mouse clicks, eye blinks, mouth opening/closing, and sometimes eyebrow movement should be used.

Architecture Diagram
IV. ALGORITHM

A. Face Detection

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

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

B. Continuously Adaptive Mean-Shift Algorithm

As faces are tracked in video sequences, mean shift algorithm is modified to deal with the problem of 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 dynamically changing color probability distributions. The block diagram of the algorithm is given below:
C. Haar-Face Detection

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.

D. Eye Detection

Two different methods were implemented in the project:

a) Template-Matching
b) Adaptive Eigen Eye Method

E. 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.

F. Adaptive Eigen Eye Method
Adaptive Eigen Eye Method is based on the well-known method Eigen Faces. However as the method is used for eye detection we named it as "Eigen Eye Method". The main idea is to decompose eye images into a small set of characteristics feature images called eigen eyes, which may be thought of as the principal components of the original images. These eigen eyes function as the orthogonal basis vectors of a subspace called eye space. However we know that the eigen face 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 (Eye Width / Face Width 0.35), we can provide scale-invariant detection using only one database.

V. CONCLUSION AND FUTURE SCOPE

"Eye Tracking Mouse" 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. Future scope may include improving the tracking robustness against lighting conditions; perhaps by using more sophisticated and expensive capturing devices such as infrared cameras that can operate in absence of light and give more accurate tracking results. Adding the double left click and the drag mode (enabling/disabling with the right double eye blink ) functionalities. Adding voice commands to launch the program, start the detection process, and toenable/disable controlling the mouse with the face.

VI. REFERENCES


