

Controlling Mouse Motions Using Eye Blinks, Head Movements and Voice Recognition

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Abstract: We describe a system that presents a hands-free interface between human and computer. Our system replace conventional mouse in a new way that makes use of human facial features. It uses various image processing methods such as face detection, eye extraction and voice recognition. It uses a typical webcam to capture an input image. Controlling of mouse cursor is obtained by face movement as moving face up, down, left and right and mouse events are controlled through eye blinks and voice. To perform these operations different algorithms like Haar Cascade algorithm, Template Matching and Hough transformation are used. Our system is mainly aimed for disabled peoples to have effective communication with computer.

Keywords: Face detection, Eye extraction, Voice recognitions, Haar cascade, Template matching, Hough transform.

1. Introduction

Recently there has been a growing interest in developing natural interaction between human and computer. Several studies for human-computer interaction in universal computing are introduced. The vision-based interface technique extracts motion information without any high cost equipments from an input video image. However, to develop a vision-based multimodal human computer interface system, an eye and face tracking and their recognition is done. Our system also proposed voice recognition.

All ordinary devices require manual control and cannot be used by persons impaired in movement capacity. There is a need for developing alternative methods of communication between human and computer that would be suitable for the persons with motor impairments and would give them the opportunity to become a part of the Information Society. A vision-based system for detection of eye and face movements is presented, together with its implementation as a Human-Computer Interface for people with disabilities. The proposed work includes face detection, face tracking, eye-blink detection, voice recognition and interpretation of a sequence of blinks in real time to control a non-intrusive human-computer interface.

To replace the traditional mouse with the human face and eye movements to interact the Computer. It is to assist the

physically challenged persons without hands to use the computer efficiently and also easy.

1.1 Problem Definition

As accordingly to the previously invention mouse motion through eye blink was possible but the circumstances that occurred were the small blink or shorts blink were neglected. Even hardware was used for detecting eye blinks but it used to cause a eye damage. Our system uses only webcam for detecting face and eye movements and microphone for voice recognition to give better output.

1.2 Proposed System

Our system is real time which captures a movement of mouse cursor through face detection and facial features. It overcomes the existing system by avoiding the use of external hardware that caused serious eye damages. It uses a template matching method for eye extraction instead of using hardware, even as in previous system the short blinks of eyes were avoided or neglected. In this system the hard blink is only used for selecting particular file or folder .With eye detection it's first aim is to captured face for the movement of mouse cursor. Then it reacts as the mouse does.

2. Literature Review

“Controlling mouse using eye movements”, (IJAIEEM), 2013.[2]

During this paper survey implementation of controlling mouse motion is done by tracking face and multiple eye blinks .Face detection is an important aspect that are undertaken using featured-based and image based method. Featured-Based method finds the facial features and performs geometrical analysis for their locations, areas and distances from each others.

Image-based method is based on scanning the image of interest with a window that looks for faces at all scales and locations. The detected face from this method is used with template matching.

It has used universal approaches for eye detection namely regression approach, Bayesian approach and discriminative approach. These approaches gives output as minimizing distances between actual and predicate eye positions, learning of eye appearance and non-eye appearance and treat the problem as feature classifications.

“Cursor control system using facial expressions for human-computer interaction”, (IJETCSE), April 2014 [3].

During this paper survey, the model parameters which encode the variations caused by blinking are analyzed and determine. The Haar cascading algorithm is used for face detection and template matching is for eye extraction. It extracts the eye portion by certain geometrical dependencies. Eye tracking is done by template matching and it is performed at its initial stage. It has used face classifiers for movement of cursor (such as up, down, left, right). The main stages included in this system is first it detects face from the video then second eye extraction then third stage is feature extraction then last courser movement and mouse event.

3. Goal of the system

1. Hands-free mouse controlling
2. To establish vision based system
3. Controlling mouse motions using facial gesture and voice
4. To eliminating the limitations of stationary head
5. To provide real time eye tracking

4. Design

Architectural diagram

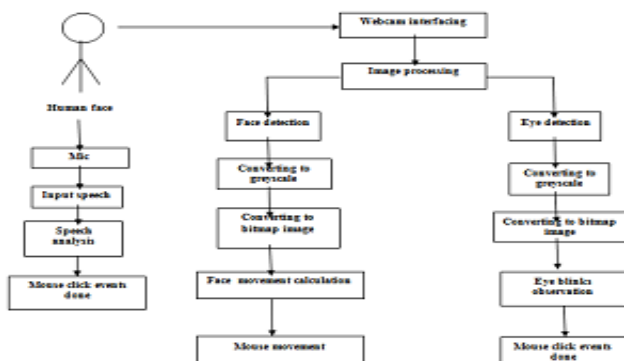


Figure 4.1 Architecture of system

Interface diagram

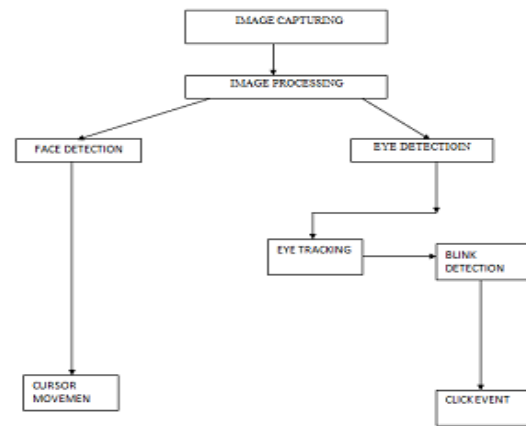


Figure 4.2 Interface of the system

5. Working

FACE DETECTION

Haar cascade algorithm is used for face detection. Object is recognized using Haar cascade feature. This feature consider adjacent rectangle at a specific location in a detection window. The common Haar feature for face detection has two adjacent rectangles that lie above the eye and the cheek region. Haar cascade algorithm always captures positive images as well as negative images for face detection. In face detection edge detection and line detection is carried out.

The algorithm has four stages:

1. Haar Feature Selection
2. Creating an Integral Image
3. Adaboost Training
4. Cascading Classifiers

EYE DETECTION

A digital processing concept Template matching is used for detecting small parts of image with templates. cv2.Matching Template () function is used in OpenCV. Template means loading an input image and a patch image. In template matching it compares the patch of input image under the template image.

VOICE DETECTION

Voice detection is carried out using Microsoft Speech SDK Tool. This tool works by taking an input as a user voice and performs commands by filtering and analyzing the voice from the user.

6. APPLICATIONS

- A. Hands-free PC control can be used to track faces both precisely and robustly. This aids the development of affordable vision based user interfaces that can be used in

- many different educational or recreational applications or even in controlling computer programs.
- B. Mostly this system is useful for handicap people to enjoy many computer activities and gives them opportunity to cooperate with the computer society.
 - C. The real life situation of eye tracking system. Eye tracking is test usability of software, interactive TV, video game, advertisement and other such activity. Eye tracking are used for reading techniques. Eye tracking uses to examine usability of websites where user will focus their attention on. The motivation from image viewing behavior, expectation of regarding web site and how use view web site.
 - D. On execution the application makes the cursor move with the help of the eye independent of the desktop.

7. RESULTS

Our system's aim is to control the mouse motions and events hands-free by using face, eye blinks and voice. And our system is able to give the output as expected.

We got the result as follow:

Face and Eye detection

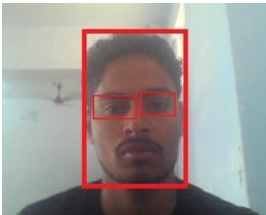


Figure 7.1 Face and eye extraction

According to face movement mouse cursor will move. After that eye blinks will observed and from that mouse click events will work.

8. CONCLUSION

This system focused on the analysis of the development of controlling mouse cursor movements using human face, eyes and voice, application in all aspects. Initially, the problem domain was identified and existing commercial products that fall in a similar area were compared and contrasted by evaluating their features and deficiencies. The usability of the system is very high, especially for its use with desktop applications. It exhibits accuracy and speed, which are sufficient for many real time applications and which allow handicapped users to enjoy many computing activities.

9. REFERENCE

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This is the final year B. E. project