Journal of Engineering Sciences

Vol 11, Issue 4 , April/2020
ISSN NO:0377-9254

FACE CURSOR MOVEMENT USING OPEN CV

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ABSTRACT

Some peoples cannot able to operate computers because of an illness. The idea of eye controls of great use to not only the future of natural input but more importantly the handicapped and disabled. Moreover, implementing a controlling system in it enables them to operate computer without the help of another person. It is more helpful to handicapped peoples. Those are need to operate computers without hand this one is most useful those can operate cursor by movement of eye. In this paper Camera is capturing the image of eye movement. First detect pupil center position of eye. Then the different variation on pupil position gets different movement of cursor. What all these applications have in common is that the use of personal computers is mostly based on the input method via keyboard and mouse. While this is not a problem for a healthy individual, this may be an insurmountable bound for people with limited freedom of movement of their limbs. In these cases it would be preferable to use input methods which are based on more abilities of the region such as eye movements. To enable such substitute input methods a system was made which follows a low-price approach to control a mouse cursor on a computer system. The eye tracker is based on images recorded by a mutated webcam to acquire the eye movements. These eye movements are then graphed to a computer screen to position a mouse cursor accordingly. The movement of mouse by automatically adjusting the position where of eyesight. Camera is used to capture the image of eye movement. 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. There are different reasons for which people need an artificial of locomotion such as a virtual keyboard. The number of people, who need to move around with the help of some article means, because of an illness. Moreover, implementing a controlling system in it enables them to move without the help of another person is very helpful. The idea of face controls is of great use to not only the future of natural input but more importantly the handicapped and disabled. It uses various image processing methods such as face detection, eye extraction. It uses a typical webcam to capture an input image. Camera is capturing the image of eyes, mouth, nose and head movement. First detect pupil center position of nose. Then the different variation on face position get different command set for virtual keyboard. The signals pass the motor driver to interface with the virtual keyboard itself. The motor driver will control both speed and direction to enable the virtual keyboard to move forward, left, right and stop.

Keywords: Eye extraction, cursor movement, eyeball movement, position matching, face recognition.

1. INTRODUCTION

Nowadays personal computer systems are carrying a huge part in our everyday lives as they are used in areas such as work, education and enjoyment[1].

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What all these applications have in common is that the use of personal computers is mostly based on the input method via keyboard and mouse. While this is not a problem for a healthy individual, this may be an insurmountable bound for people with limited freedom of movement of their limbs. In these cases, it would be preferable to use input methods which are based on more abilities of the region such as eye movements[2]. To enable such substitute input methods a system was made which follows a low-price approach to control a mouse cursor on a computer system. The eye tracker is based on images recorded by a mutated webcam to acquire the eye movements. These eye movements are then graphed to a computer screen to position a mouse cursor accordingly. The movement of mouse by automatically adjusting the position where of eyesight. Camera is used to capture the image of eye movement. Recently there has been a growing interest in developing natural interaction between human and computer[3]. Several studies for human-computer interaction in universal computing are introduced. The vision-based interface technique extracts motion information without any high cost equipment from an input video image. Thus, vision-based approach is taken into account an effective technique to develop human computer interface systems [41] [42]. For vision-based human computer interaction, eye tracking is a hot issue. Eye tracking research is distinguished by the emergency of interactive applications. However, to develop a vision-based multimodal human computer interface system, an eye tracking and their recognition is done [43] [44]. Real time eye input has been used most frequently for disabled users, who can use only their eyes for input[4][5]. There are different reasons for which people need an artificial of locomotion such as a virtual keyboard. The number of people, who need to move around with the help of some article means, because of an illness. Moreover implementing a controlling system in it enables them to move without the help of another person is very helpful [45] [46]. The idea of eye controls of great use to not only the future of natural input but more importantly the handicapped and disabled.

Fig 1: Eye ball position extraction

All ordinary devices require manual control and cannot be used by persons impaired in movement capacity[6]. 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 [47] [48]. 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[7][8]. The proposed work includes face detection, face tracking, eyeblink 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[9]. It is to assist the physically challenged persons without hands to use the computer efficiently and also easy.

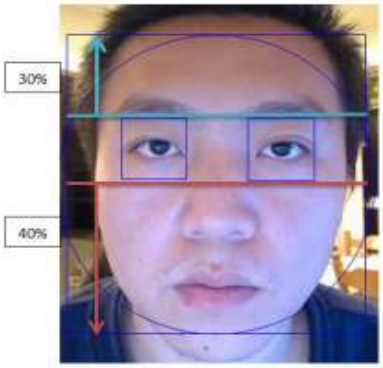

Fig 2: Top 30% and bottom 40% are not in the search area

Eye tracking is used to study users' attention patterns during task performance or to allow hands-free interaction with a computer for persons unable to use the traditional mouse and keyboard-based control inputs[10][11]. As eye-tracking technology advances into the future, it can be clearly seen that it is advantageous to utilize eye-tracking as a replacement for traditional control tasks especially for disabled users. In some cases, the use of eye tracking fits naturally with the intended task, for example a camera that utilizes the user's eyes to focus the lens at the location that the user is currently looking[12]. At the same time, the performance of eye tracking equipment can vary due to many factors including low accuracy.

Testing the Eye Mouse algorithm involved recording the accuracy and error ratios of the algorithm on a test subject. A static test used a fixed distance between the subject's face and the camera was used to ensure a more accurate detection[13]. When testing, the user was only required to move their head and eyes and the developer recorded the accuracy level of the tracking window. Important point in the development of interactive software In the field of games; it is a way to increase immersion in the virtual world[14]. Classical interactions with mouse, keyboard or game pad, are limited in comparison with the reality of devices like head mounted electrodes used in games. A growing trend is to concentrate on new kinds of interfaces between the player and the virtual world.[15] e.g. some approaches use a headpiece device to detect head movements. In this research project we have tried to explore the field of computer vision with the broad aim of developing a system capable of interpreting the movements of human facial features. The project aims to create a simple prototype for face detection and face tracking simulating mouse motion[16]. We develop a system that uses a camera to visually track a feature on a person's face, e.g. the tip of the nose, and use the movement of the tracked feature to directly control the mouse pointer on a computer[17]. Clicking operation of mouse is accomplished using other part of face. The facial movements considered are rotation of the head and blinking of the eyes. The three dimensional position of the head is tracked and converted to 2D coordinates on the computer screen. Intentional blinks are recognized and interpreted as an action[18]. The tracker works uniquely using the real time video of the person sitting in front of the screen.

2. LITERATURE SURVEY

Students' eye movements during debugging were recorded by an eye tracker to investigate whether and how high- and low-performance students act differently during debugging. Thirty-eight computer science undergraduates were asked to debug two C programs. The path of students' gaze while following program codes was subjected to sequential analysis to reveal significant sequences of areas examined [19]. These significant gaze path sequences were then compared to those of students with different debugging performances. The results show that, when debugging, high-performance students traced programs in a more logical manner, whereas low performance students tended to stick to a line-by-line sequence and were unable to quickly derive the program's higher-level logic[20]. Low-performance students also often jumped directly to certain suspected statements to find bugs, without following the program's logic. They also often needed to trace back to prior statements to recall information and spent more time on manual computation.

Real-time driver distraction detection is the core to many distraction countermeasures and fundamental for constructing a driver centered driver assistance system. While data driven methods demonstrate promising detection performance, a particular challenge is how to reduce the considerable cost for collecting labeled data. This paper explored semi-supervised methods for driver distraction detection in real driving conditions to alleviate the cost of labeling training data [21]. Laplacian support vector machine and semi supervised extreme learning machine were evaluated using eye and head movements to classify two driver states: attentive and cognitively distracted. With the additional unlabelled data, the semi-supervised learning methods improved the detection performance (G-mean) by 0.0245, on average, over all subjects, as compared with the traditional supervised methods.

Face detection is an important aspect that is undertaken using featured-based and image based method [22]. Featured-Based method finds the facial

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features and performs geometrical analysis for their locations, areas and distances from each others[23]. 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[24]. 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.

3. PROPOSED METHOD

In our proposed system the cursor movement of computer is controlled by eye movement using Open CV. Camera detects the Eye ball movement which can be processed in Open CV. By this the cursor can be controlled.

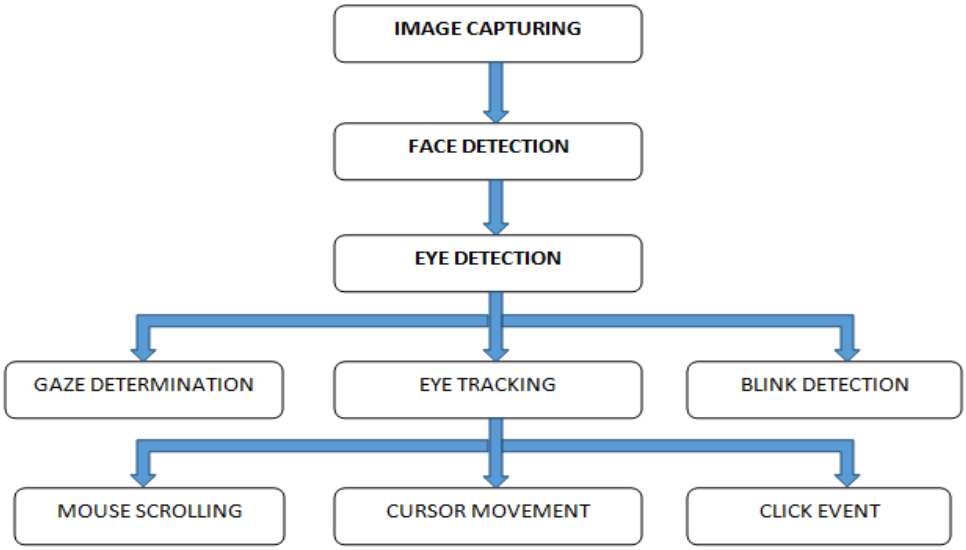

Fig 3 Block diagram

The user has to sits in front of the display screen of private computer or pc, a specialized video camera established above the screen to study the consumer's eyes[25]. The laptop constantly analysis the video photo of the attention and determines wherein the consumer is calling at the display screen not anything is attached to the consumer's head or body. To "pick out" any key, the user seems at the key for a exact period of time and to "press" any key, the consumer just blink the eye [26][27]. On this device, calibration procedure is not required. For this system enter is simplest eye. No outside hardware is connected or required.

Camera gets the input from the eye. After receiving these streaming movies from the cameras, it'll spoil into frames. After receiving frames, it will check for lights conditions because cameras require enough lighting fixtures from external sources in any other case blunders message will show at the screen [28]. The captured frames which can be already in RGB mode are transformed into Black 'n' White. Five. Pics (frames) from the enter supply focusing the eye are analysed for Iris detection (middle of eye).After this, a mid point is calculated through taking the suggest of left and right eye centre point[29].

Haar cascade algorithm is used for face detection. Object is recognized using Haar cascade feature[30]. 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[31]. And then the eyes are detected. We use individual eye blinks as left and right clicks of the mouse for opening and closing of anything in the screen. We use mouth for opening and closing of this application[32]. When we first open the mouth then

the working of this application starts and when we open the mouth again then the application will be closed.

The goal of the proposed method is

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

Each time when a single face is detected, its location is calculated and passed to the features identification algorithm. The approach used here is an image-based face recognition technique based on Haar faces[33][34]. An algorithm is applied on real-time video clip provided by the camera for frame by frame analysis in order to detect the movements of each single feature. The number and the initial position of the facial features are obtained. The initial configuration of the features is stored in the memory[35]. And for the selected feature i.e. the tip of the nose, the difference between its current and initial location is calculated. The average of all the differences is then calculated. In this way the tracker detects a small movement when the head performs a roll[36].

```
for (x, y) in np.concatenate((mouth, leftEye, rightEye), axis=0):
    cv2.circle(frame, (x, y), 2, GREEN_COLOR, -1)
     if diff_ear > WINK_AR_DIFF_THRESH:
    if leftEAR < rightEAR:      cv2.circle(frame, (x, y), 2, GREEN_COLOR, -1)
     if diff_ear > WINK_AR_DIFF_THRESH:
    if leftEAR < rightEAR:
      if leftEAR < EYE_AR_THRESH:
        WINK_COUNTER += 1
       if WINK_COUNTER > WINK_CONSECUTIVE_FRAMES:
                        pag.click(button='left')
       WINK_COUNTER = 0
     elif leftEAR > rightEAR:
      if rightEAR < EYE_AR_THRESH:
        WINK_COUNTER += 1
      if WINK_COUNTER > WINK_CONSECUTIVE_FRAMES:
          pag.click(button='right')
        WINK_COUNTER = 0
        else:
      WINK_COUNTER = 0
  else:
    if ear <= EYE_AR_THRESH:
      EYE_COUNTER += 1
```

Table1: Sample Source Code

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In a 2x2 pixel grid pattern, it still gave acceptable results as the overall area for each of the four regions (Top and Bottom Left and Right corners) was immense, hence any small irregular movements still placed the eye movements within the region[37][38]. However a 3x3 pixel grid pattern gave minor but now incorrect positioning of the eye movements with regards to where the user was looking to. With every +1/-1 pixel change in real life was a huge difference on the tracking window that was decreasing in region area. Secondly, reflection from bright surfaces, e.g. white tracking screen caused inaccurate pupil detection[39]. Because the process of detecting pupil involved locating the darkest part of the eye via Integral imaging[40] and Haar cascading features, using a bright screen caused a reflection onto the pupil area that caused the loss of dark areas when initializing it hence often detected different/multiple parts of the eye and this led to problem discussed directly above.

4. 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.

Fig4. Face and eye extraction According to face movement

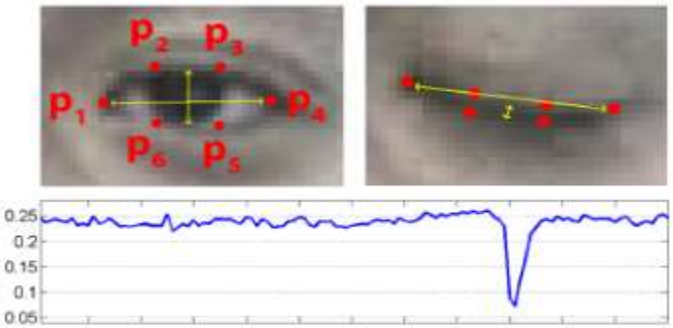

Fig 5 Eye blinks will observed and mouse click events

Fig 6:Cursor Movements observed

5. CONCLUSION

To conclude, from observations and results collected, there is a reasonable amount of accuracy present despite using a non-high definition web camera and the standard pre-defined classifiers present in the OpenCV. User tests showed some accuracy in locating and tracking eye movement and passed most of stability tests for the regions it covered. However, more testing and development on the pre-defined classifiers and overall algorithm is needed so that it may be able to detect dynamic movements, not only static, allowing users more freedom and with high accuracy in reading faces and reducing limitations in pupil detection and movement. The paper presents a simple and effective low cost optical system for implementing mouse operations using processed head motion. The system consists of a webcam and a computer and our application software. Images from the webcam are analyzed using a combination of software in order to determine the position of the user's head. This head position data is then transformed using a non-linear transformation into a corresponding screen position that is used to control the mouse pointer. Clicking operations are accomplished using eye blinks. This system focused on the analysis of the development of controlling mouse cursor movements using human face, eyes and mouth 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.

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