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Face Cursor Movement Using Viola-Jones Algorithm

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ABSTRACT

Illiterates are unable to use the system, just as literates. Because of this, the face cursor movement will assist them by providing commands to move the pointer. Additionally, paraplegic individuals can make advantage of this face cursor movement. Using the face cursor primarily makes it possible for people who are illiterate to move independently. This face cursor movement is more helpful for those who are unable to use a computer without a hand since they can operate the device by moving their faces. Several image processing methods, such as face detection and eye extraction, are used in this method. The image for the input is captured using a typical webcam. The movements of the head, lips, nose, and eyes are being captured by the camera. The face should be the focal point of the system when the face has been detected. Then, different commands are set on the virtual keyboard for the various variations of facial orientations.

Keywords- Camera, Face Detector, Face Tracking, Digital Image Processor, Matlab.

1. INTRODUCTION

There are several studies for universal computing human-computer interface. The face movement-based interface technology extracts motion information from an input video image without the need for expensive hardware. Consequently, a vision-based approach is thought to be a practical way to develop human computer interfaces. Eye, mouth, and nose tracking is a popular topic in face movement-based human-computer interaction. The need for interactive applications distinguishes face movement tracking research. However, mouth, nose, and eye tracking and recognition are done in order to create a face movement-based multimodal human computer interface system. Users with disabilities who are limited to using only their faces as input have most frequently employed real-time face input. People need artificial means of mobility like a virtual keyboard for a variety of reasons. The number of persons who, as a result of a medical condition, must move around with the aid of some object. It is also quite advantageous to have a controlling mechanism that enables them to move independently. Face controls are an excellent idea for the future of natural input and, more significantly, for the benefit of the paralysed and impaired. Eye movement is being photographed by the camera. First locate the eye's pupil in the middle.

2. LITERATURE SURVEY

Rfid-based attendance system is the title of a 2009 article by T. Lim, S. Sim, and M. Mansor that appeared in Industrial Electronics & Applications. Radio waves are employed in radio-

frequency identification (RFID) technology to send data from an electronic tag, sometimes referred to as an RFID tag or label, attached to the object in order to identify and track it. As a component of their automation systems, numerous firms have used RFID technology, a mature technology. In this study, a time-attendance management system has been created using an RFID-based system.

One of the most trustworthy biometric personal identification techniques is iris recognition verification, according to the author. Numerous applications for iris recognition verification, such as time attendance systems, have been suggested thus far due to the technology's quick growth. In this work, a wireless iris recognition attendance management system is built and put into operation using Daugman's method. The problems of counterfeit attendance as well as the challenge of building the required network are addressed by this system-based biometric and wireless technology. It can more easily and productively increase user attendance.

Another way to collect information for face identification is by using thermal cameras, which solely recognise the contour of the head and disregard any subject accessories like glasses, hats, or makeup. Using thermal pictures for face recognition is troublesome because there aren't enough face recognition databases. Diego Socolinsky and Andrea Selinger (2004) conduct research on the application of thermal face identification to operational settings and real-world situations while simultaneously creating a new library of thermal face photos. Ferroelectric electric sensors with low sensitivity and low resolution that can capture long wave thermal infrared are employed in the study (LWIR). The findings indicate that for outdoor probes, a combination of normal visible and LWIR cameras produces the best results. Visual has an accuracy rating of 97.05% indoors, compared to LWIR's 93.93% and Fusion's 98.40%, while outdoor results place visual at 67.06%, LWIR at 83.03%, and Fusion at 89.02%. The new database was created through the study's utilisation of 240 participants over the course of 10 weeks.

This study focuses on the challenge of face recognition as a component of a unimodal biometric system before combining face and fingerprint information to create a reliable multimodal biometric system.

3. EXISTING SYSTEM

The current technology uses Open CV to track eye movement to control computer cursor movement. The movement of the eyeball is detected by the camera and analyzed by Open CV. The cursor can be managed in this way. The camera records the position of the eye in various positions using Open CV. And the control is done by giving different positions of eye. In this, the Computer or Laptop constantly analysis the video and determines the eye position. Camera gets the input from the eye. The position of cursor depends on the different movements done by the eyes. By using the blinks of eyes, the mouse clicks will do. In this way, the cursor movement can be controlled.

Disadvantages of Existing System

- It is not more efficient
- It is difficult to move and track the eye ball

4. Proposed System

In our suggested method, Open CV is used to track face movement to control computer cursor movement. Eyes, nose, mouth, and head movement are detected by the camera and processed by Open CV. The cursor can be moved by making these motions.

This project is mainly useful for the physically challenged (paralyzed) people, who depend on others for operating Computers, Laptops. In this project, we use face, mouth, and eyes instead of hands in operating computers. It employs a number of image processing techniques, including face detection and eye extraction. Here, we take an input image using a camera. The camera will initially record the movement of the head, mouth, nose, and eyes. Determine a person's nose's centre position first. Then, different commands are set for the virtual keyboard based on the various differences in face position. Then, based on the face movements the cursor will move up, left, right and down. After completion of the work, the user quits the window by using (quit ()) 'q'. By pressing 'q' this application window is closed.

The algorithm that is being suggested here is based on real-time monitoring of the MAR (Mouth Aspect Ratio) and EAR (Eye Aspect Ratio) using image processing. Using pre-trained Neural Network based D-lib functions; facial landmarks have been recognised in HD live footage that has been fragmented into continuous frames. The main image processing tool is Intel's Open Source Image Processing Libraries (OPEN CV). The primary coding language used today is Python. The Euclidean distance between the measured eye coordinates is used to calculate EAR. The Euclidean distance between the measured mouth coordinates is used to calculate the MAR. Monitoring EAR and MAR against a threshold value enables the implementation of the blink and mouth opening detection technique. When the MAR and EAR values are higher than the threshold value, blinks and mouth movements are made.

Here we have used Open CV where CV is Computer Vision and it is a Python library which is designed to solve computer vision problems. We also used SciPy and Matplotlib libraries. Convolutional neural networks have been used in computer vision, which is one of the most significant advancements in the field.

• Pointer of the mouse will move on screen

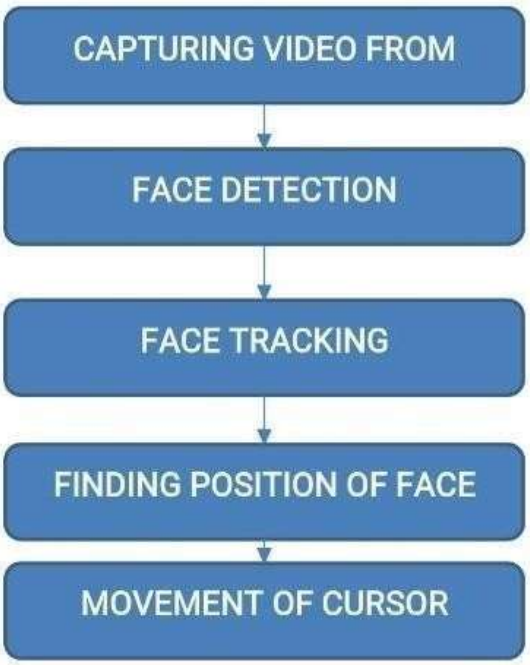


Fig 1: Block Diagram of the system

5. Hardware Requirements:

· System : Intel I-5, I-7 Processor.

· Hard Disk : 500 GB.

· Floppy Drive : 1.44 Mb.

· Monitor : 14’ Color Monitor.

· Mouse : Optical Mouse.

· Ram : 4 GB.

6. SOFTWARE REQUIREMENTS

Used software : Matlab, python

7. Viola-Jones Algorithm:

Any image, regardless of size, must include a human face at some point, and that face must be recognized by a face detector. Binary classification, where a classifier is built to reduce the risk of misclassification, is a suitable foundation for thinking about this issue. The method must reduce both the false positive and false negative rates in order to work as intended because the prior likelihood that a particular image contains a face cannot be accurately represented by an objective distribution. This challenge involves a precise numerical representation of the characteristics that distinguish human faces from other objects. These characteristics can be obtained from data using the novel committee learning technique known as Adaboost, which relies on a group of weak classifiers to build a strong one through a vote process. A classifier is generally deemed weak if it fails to meet a predetermined classification target in error terms. An efficient algorithm must also have a reasonable processing budget. Thanks to techniques like integral image and attention cascade, the Viola-Jones algorithm [10] is quite effective. It functions nicely on a normal PC when fed with a real-time image sequence generated by a typical camera. Haar-like features, which are the scalar products of a few Haar-like templates and the image, are used by the Viola-Jones algorithm. Let N N be the same-sized image and P be the same-sized pattern, respectively (see Figure 1). A1iN A1jN I describe the characteristic

linked to pattern P in image I. (i, j) White is 1P(i,j)X1iNX1jN. 1P for I I j) Black (i,j). To take into consideration the effects of varying lighting situations, each shot should have its mean and variance normalized beforehand. Images with variances less than one, which by nature carry little valuable information, are not considered.

8. Kanade Lucas Tomasi (KLT) Face Tracking Algorithm:

Each shot should have its mean and variance normalised beforehand to account for the impact of various lighting conditions. Images with variations under one, which by definition contain little useful information, are not taken into consideration. Because standard feature extraction and registration methods are frequently expensive, KLT is a great way for tracking features from one image to the next. KLT uses the spatial intensity data directly to produce the best results. The key benefit of this tracker is that it performs really quickly when compared to other methods when there aren't many potential matches between the photos. It uses the Newton-Raphson iteration method and a coarse-to-fine strategy for picture registration [14]. The minimal eigen value and the number of features are the only initial parameters that need to be set for this tracker.

In the second publication, Tomasi and Kanade employed the same fundamental strategy for determining the registration resulting from translation, but they enhanced the method by monitoring features that are appropriate for the tracking algorithm. If the gradient matrix's two eigen-values were both greater than a predetermined threshold, the suggested features would be chosen.

The issue is stated as where is the gradient by a very similar derivation. This is the same as the final Lucas-Kanade formula mentioned before. If both of the two eigenvalues (and) of are greater than a predetermined threshold, a local patch is regarded as a useful feature to follow.

A KLT tracker is a tracking technique that is based on these two papers.

Improvements and variations

Shi and Tomasi suggested an additional stage of confirming that features were accurately monitored in a third publication.

The image of the monitored feature in the current frame and the image from a non-consecutive previous frame are fit using an affine transformation. The feature is dropped if the affine corrected image is too different.

A translation model is sufficient for tracking between consecutive frames, but when frames are separated by a greater distance, a more complex model is needed due to more complicated motion, perspective effects, etc.

Shi and Tomasi demonstrated that the search may be carried out using the formula using a similar derivation as for the KLT.

9. INTEGRATED WEBCAM

Built-in web cameras that are integrated into the computer's chassis. A webcam that is integrated into many laptops is located above the screen, for instance. Although it might have fewer features, this webcam functions in the same way as an external webcam. Some monitors and all-in-one PC units also have internal webcams.

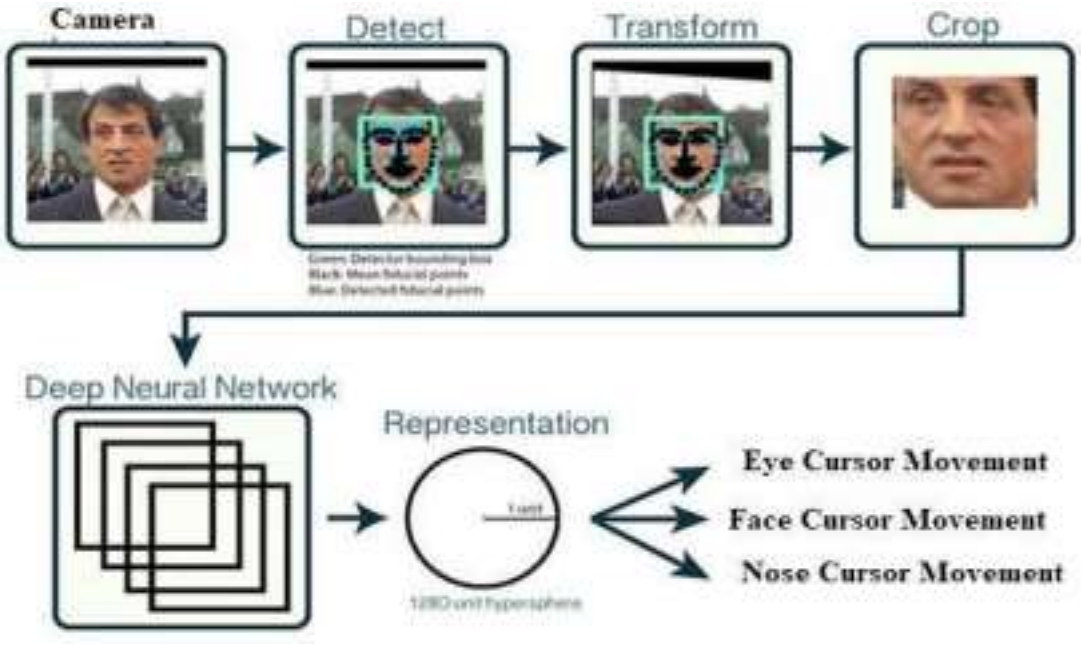
A laptop's embedded cameras are made to snap pictures, enable video conferencing, and record videos. It can be employed in a variety of situations and contexts.

Advantages

- Provides accuracy
- People with physical disabilities can use computers
- Wireless mouse
- Creates a system based on vision
- Using facial expressions to control mouse movements
- Provides real time eye and face tracking
- The mouse pointer moves where the user is looking on the screen, and clicks are made by blinking.

10. Design overview:

Regardless of the development methodology or the field of application, software design forms the technical foundation of the software engineering process. For each technical system or product, design is the first phase of development. The goal of the designer is to produce a prototype or visual representation of the final product. System design comes first among the three technical activities—design, coding, and testing—necessary to produce and validate software. It comes after the articulation and evaluation of system requirements. The quality of the programme is most likely affected by the system's architecture, which also has a significant impact on following phases, including testing and maintenance. The design document is what comes out of this step. This document, which serves as the solution's blueprint, is utilised for implementation, testing, and maintenance.



System Design and Detailed Design are two phases that are frequently separated to complete the design process.

11. RESULTs

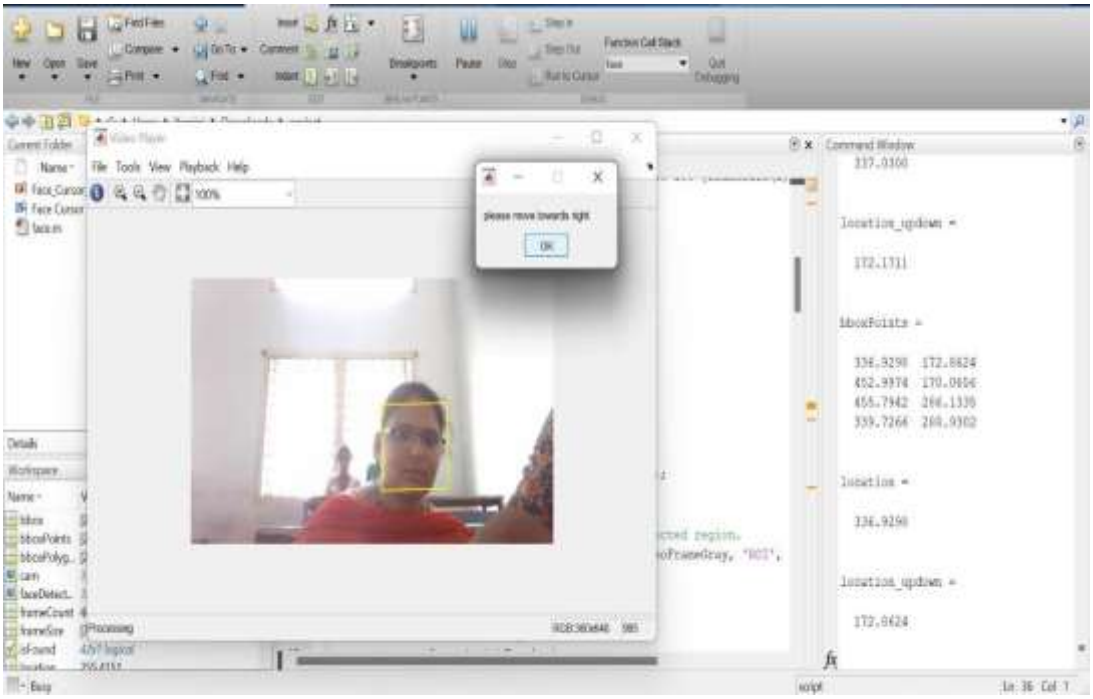


Fig 3: Detected face is moving right and cursor is moving right

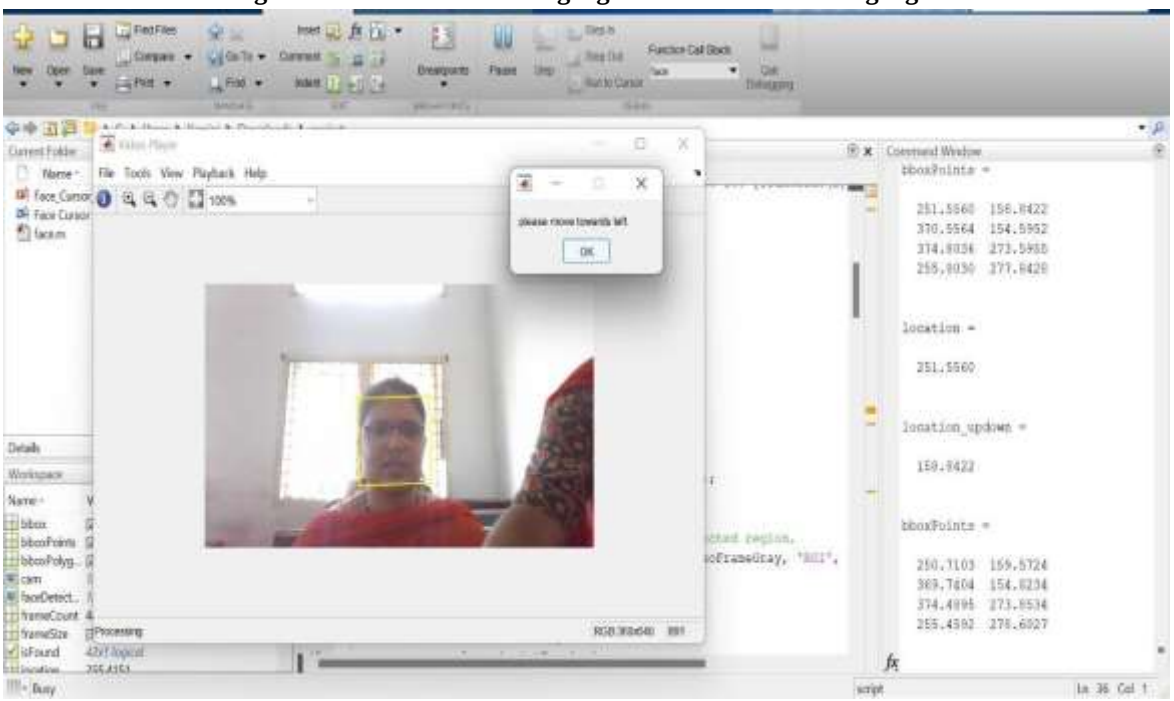


Fig 4: Detected face is moving left and cursor is moving left

11. CONCLUSION

The computer cursor movement in our proposed system is managed by tracking face movement using Open CV. The camera picks up the face's movement, which Open CV then analyses. Our method aims to eliminate the need for hands by using facial control to operate mouse operations and movements.

The experimental results in this study offer unbiased face-acking evidence that supports the hypothesis formed based on the outcomes of previous studies: Most learners are aware of beacons and focus more on these locations when troubleshooting. Only statistically significant results have been reported in the conclusions, ensuring the validity of the findings.

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