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Histogram based Human Computer Interaction for Gesture Recognition

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***Abstract*— Computer remains as the inevitable part of our daily life, or we can say that, the computer is used by every person in their work. In this project, our main aim is to make computers easily understand the human language. This paper introduces a technique for human computer interaction using open CV and python. We have first detect, pre-processing and recognize the hand fingers and the count. Then with the help of recognized fingers count, it is act as a mouse to perform the different operations and this hand mouse interface known as a "virtual monitor". The hand mouse is controlled by the virtual monitor provides a virtual space. The accuracy of the proposed algorithm is 80%. This envisioned concept controlling a system by hand has been implemented successfully with effective efforts.**

Keywords— Gesture recognition, Histogram Based Tracker, Human Computer Interaction (HCI) and Real Time Tracking.

I. INTRODUCTION

Recently in our daily life, communication between human and computer plays an important role [9]. We are always looking for more easy ways of interaction for machines. Gesture recognition is a modern, innovative and new research topic. It enables to communicate human with the machine that's why it is also known as Man Machine Interaction [10]. Using this concept, the cursor will move respectively. For human computer interaction, mainly used the input systems as mouse, keyboard etc. The hand gestures is commonly categorized into static and dynamic based on the viewable features. The hand position which does not change during the signing period is known as static hand gestures. It mainly depends on the shape and gyratory angles of the fingers. On other hand, the hand position which alters continuously with respect to time is called as dynamic gestures [16]. This paper introduces a human gesture recognition system which uses only the fingers to communicate with the computer system [11]. This algorithm has three parts: pre-processing, segmentation and feature extraction. This technology could help reduce the over dependence on the keyboard and mouse usage. In features a range [12] of applications for instance- a) dominant shopper physical science b) dominant PC games c) visual image system interaction d) mechanical systems management.

The remaining of this paper is organized as follows. In Section II mention about Literature review. In Section III describes proposed methodology and the gesture recognition steps described in section IV and in section V present our results and in section VI describes conclusion and future work.

II. LITERATURE REVIEW

Aashni Haria et al [1] developed a vigorous marker-less hand signal acknowledgment framework which can productively follow both static and dynamic hand signals. The framework makes an interpretation of the identified signal into activities. For example, opening sites and propelling applications like VLC Player and PowerPoint. For gestures they used Haar cascading classifier. Mayur Yeshi et al [2] developed a lot of movement highlights dependent on smoothed optical stream gauges. A user centric portrayal of these highlights is acquired utilizing face location, and a proficient classifier is found out to segregate between signals. They considered a hand-motion based interface for exploring a robot. A client can control a robot directly by utilizing his or her hand directions. Silas Wan et al [3] developed a system of HCI using a little hand-worn remote module with a 3-center accelerometer as the development sensor. The little free unit contains an accelerometer and a remote zigbee handset with a microcontroller. The accuracy of the proposed system is 86.3%. Here neural network classifier is used. Swapnil Athavale et al [4] developed a system to convey HCI to a routine where collaborations with computers will be as normal as a connection among people, and to this end, consolidating signals in HCI. The motion acknowledgment is done in three primary stages, for example detection, tracking, and acknowledgment. Various strategies used, these techniques incorporate Time Delay Neural Network, Gee, Dynamic Time Warping, Finite State Model. For dynamic motions, HMM instruments are impeccable and effective, particularly for robot control. Deepali et al [5] developed a audit of leather hand signal acknowledgment frameworks, this paper incorporates a concise survey on camera interface, Picture handling, color detection, hand signal acknowledgment. The accuracy of a glove input device depends on the type of sensor technology used. They utilized static and dynamic technique and in unique strategy they utilized calculation like Hidden Markov Models. Aekta Patel et al [6] developed by first detected, perceived and pre-preparing the hang signals by utilizing the general method of recognition. Then they have found the apparent picture's properties and using this, mouse advancement, and VLC media player. By using Neural

Network Method, the estimation speed increase and get exact recognition result than other strategy. Nayana et al [7] developed a strategy for human PC collaboration utilizing open source like python, opencv, the proposed calculation comprises of pre preparing, division and highlight extraction. The proposed calculation can perceive the quantity of fingers present in the hand signal. Chetan Aivalli et al [8] developed a histogram based tracker which depends on cam shift calculation and changing over hand signals in a significant direction. The level of accomplishment is 79%. It tracks an item by utilizing the continuously Adaptive Mean Shift algorithm.

III. PROPOSED SYSTEM

Using the current system even-though there are a number of quick access methods available for the hand and mouse gesture for the laptops, using our project we could make use of the laptop or webcam and by recognizing the hand gesture we could control the mouse and perform basic operations like mouse pointer controlling, select and deselect using left click, and a quick access features for file transfer between the systems connected via network LAN cable. The project done is a "Zero Cost" hand recognition system for laptops, which uses simple algorithms to determine the hand, hand movements and by assigning an action for each movement. But we have mainly concentrated on the mouse pointing and clicking actions along with an action for the file transfer between connected systems by hand action and the movements. This task is ordinarily communicated as appeared among the underneathFig.1. System Architecture and Fig.2. Sequence Diagram

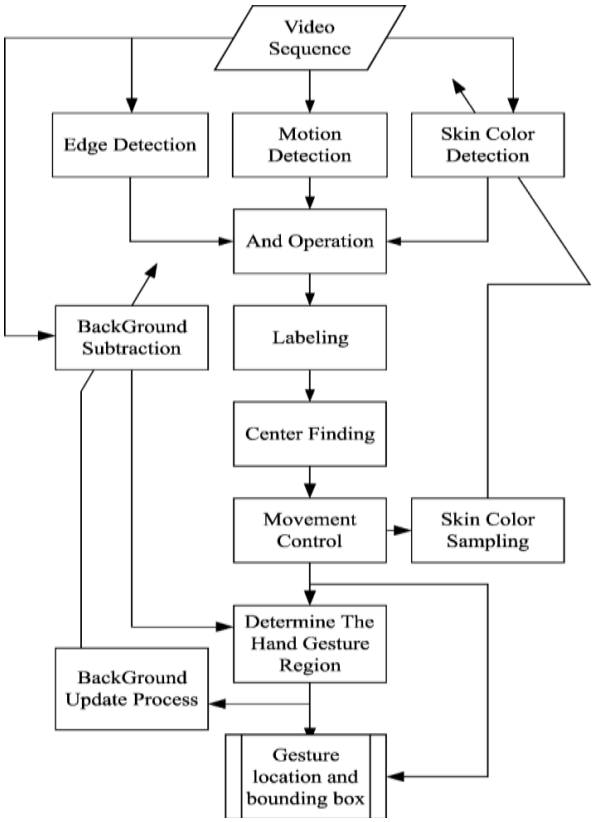


Fig. 1. System Architecture

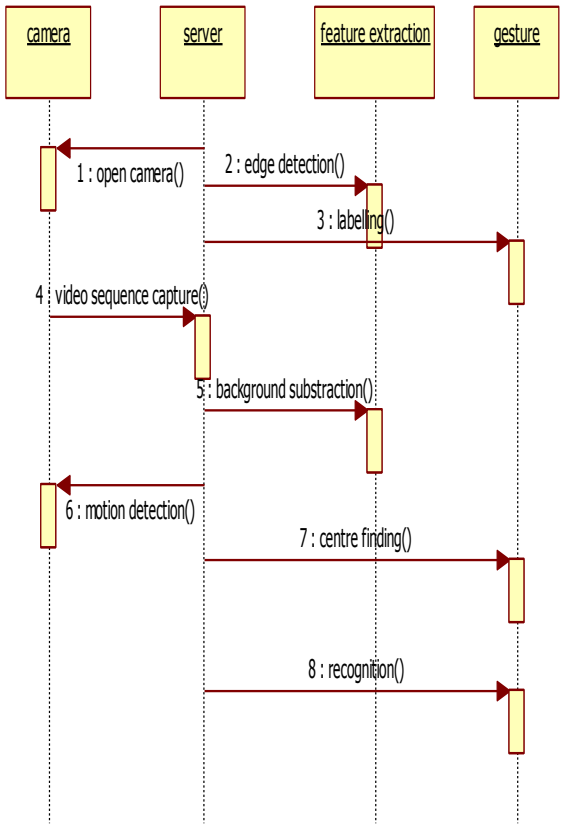


Fig. 2. Sequence Diagram

A. *Template Matching*

The basis for recognizing hand gestures is recognizing if there's a hand within the image. Hence, this paper can place substantial stress on the ways of segmenting the hand from the background of the camera (or video) input [13]. The ways below were chosen with two criteria in mind. First one is simplicity. From past works, we have seen that complicated algorithms were considerably slower and needed a lot of sophisticated origin, like standardization and classifier coaching once beginning the system during a new atmosphere. The second criteria are flexibility. Our use case involves the typical laptop computer user – World Health Organization [14] [15] could also be sitting in any atmosphere and with a background which will be complicated. It's thus fascinating to own a segmentation technique that will accommodate for various non-simple backgrounds, despite solely employing a single RGB camera.

The least complex methods for perceiving hand poses square measure through precedent coordinating. The model coordinating might be a method to see whether a given data record is regularly delegated an individual from gathering of hang on data records or not. Perceiving hand stances abuse precedent coordinating has two parts. The essential is to shape the formats by gathering data esteems for each stance precedent, most firmly coordinating the present data record by examination the present gadget readings with the given dataset.

B. *Feature Extraction*

The low-level data from the information is broken down inorder to deliver more elevated amount data and is increasingly used to perceive the stances and gestures. The framework perceived over 97% accuracy. It is a decent method to perceive hand postures and gestures. It tends to be utilized to perceive both straight forward complex hand gestures and postures. This method should be tested first. Human skin colour, especially on the surface of the palm is different from most surfaces one would find in the background. This allowed for colour contrasts between the hand and background, which can be treated as edges. Smart edge detection is done using Open CV.

As will be seen within the higher than image, smart edge detection simply forms the definition of the hand. However, they're square measure limitations of the smart edge methodology. First, it's liable to noisy. It'll be tough to accurately extract the sting contours of the hand from the background, particularly if the background has several edges further. One methodology is to try this for involving some type of form matching, probably employing a window.

However, this is often seeming to be less rotation- and size invariant. Within the image, it will be seen that some edges square measure is missing, particularly since each foreground and background square measure equally dark thanks to the dearth of lighting. This task is ordinarily communicated as appeared among the underneath Fig.3.

Fig. 3. Feature Extraction

Applying Cosine Rule to find plot for all deformities between fingers

point = math.cos ((b*2 + c2 - a*2)/(2*b*c)) * 57.

To find length of all sides of triangle

a = math.sqrt((end[0] - start[0])*2 + (end[1] - start[1])*2)

b = math.sqrt((far[0] - start[0])*2 + (far[1] - start[1])*2)

c = math.sqrt((end[0] - far[0])*2 + (end[1] - far[1])*2)

Facilitate values are acquired.

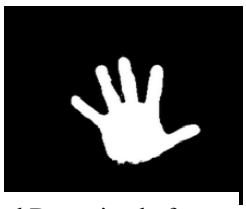
C. *Convexity Defects*

In simple words, we can say convexity defect is a cavity in a form portioned out from a picture. That implies a territory that does not have a place with the item, however situated inside of its outer boundary that is known as a convex hull.

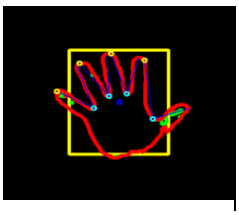
IV. GESTURE RECOGNITION

A. *Thresholding*

Thresholding is the one of the simplest method of image segmentation. It is used for eliminating the background and showing the original images. So, it can be used to create a binary image. It is connected with two-fold picture from the dark scale picture. The binary thresholding transforms the hues, to be white picture in partner degree amazingly dark found. This task is ordinarily communicated as appeared among the underneath Fig. 4.



Hand Detection before Convex hull algorithm



Hand Detection after Convex hull algorithm

Fig. 4. Thresholding and Convex Hull

B. *Contour Extraction*

The outline of a figure or body, it's called contour. The edge or line that defines as bounds a shape or object contour line. Here we can say outline of each fingers called as a contour line. The bends that interface nonstop focuses that region unit of consistent shading, territory unit raised as forms. A few signals in our acknowledgement framework with their appropriate shapes region unit appeared inside the underneath Fig.5.

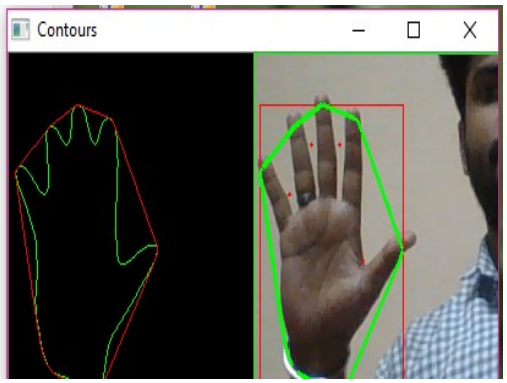


Fig. 5. Contours

V. RESULTS

This paper introduces a technique for human computer interaction using open CV and python. By using Template Matching, Feature Extraction, Convexity Defects, Thresholding and Contour extraction we discuss our

experimental result in the section. We use the fingers for three functions, for finger count =3 cursor movement execute, for finger count =4 left click and for finger count =5 right click execute.

This task is ordinarily communicated as appeared among the underneath Fig.6. Left Click, Fig.7. Right Click, and Fig.8. Cursor Operation.

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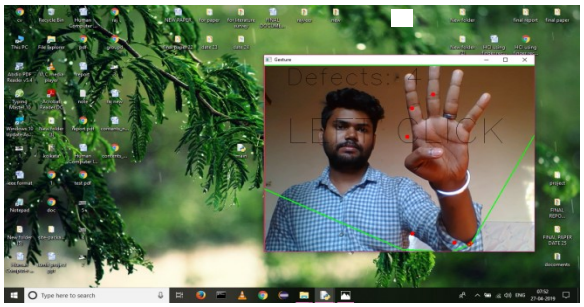

Fig. 6. Left Click

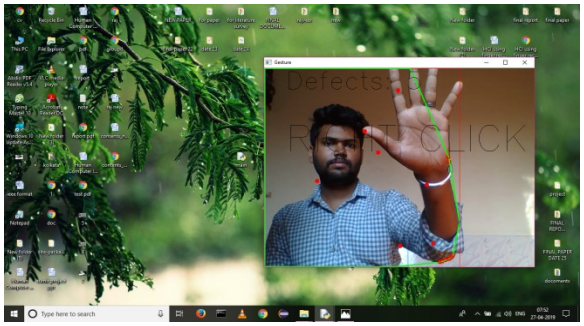

Fig. 7. Right Click

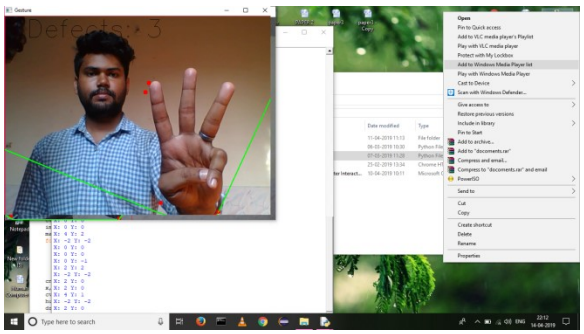

Fig. 8. Cursor Operation

VI. CONCLUSION

Human Computer Interaction (HCI) using finger recognition has successfully implemented and achieved with an accuracy of 80%. However, it is known that the accuracy of the support-vector machines depends upon the features that were used in the work. The proposed algorithm can be used to detect other skin colour filtering, edge detection, convex-hull computation, and a rule primarily based reasoning with the depths of the convexity defects.

In the future scope of this paper is to train and test this algorithm on a large number of data sets and to compare results with other algorithms. Neural Networks identification can also be applied for the diagnosis of the finger recognition in the future.

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