

## *A Review on Various Hand Gesture Recognition Techniques*

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*Abstract: Gesture is the most primitive method for communication among human being. Today in the time of present day innovation gesture recognition impacts the world differently, from the physically challenged individuals to robot control to virtual reality conditions. Compared to the frameworks which utilize additional devices (gloves, sensors), vision-based frameworks are more easy to use and basic. Vision-based frameworks are anything but difficult to utilize, yet most hard to execute. This paper introduces an extensive review on the vision-based dynamic gesture recognition approaches, a relative report on those methods, and find the issues and challenges in this area.*

*Keywords: Gesture recognition, human-computer interaction, computer vision, dynamic gesture recognition, Hand Feature Extraction.*

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### I. INTRODUCTION

Human hand gestures give the natural and effective method of non-verbal communication with the computer interface. Hand gestures are the significant body movements that are movements of hands, arms or fingers. Hand gesture recognizable proof ranges from the static gesture with the intricate foundation or dynamic gestures that express the human feeling and speak with computer or humans. The hand is specifically use as the contribution to the machine, for the communication reason for gesture identification there is no need of an intermediate medium.

Gesture recognition is the way toward distinguishing the gestures by the computer which is made by the client. Human can control the machine by the hand gesture is characterize in [1]. There are basically two methods of hand gesture recognition. One is static hand gesture and another is dynamic hand gesture. Static hand gesture method could just perceive the predefined gesture. While in the dynamic hand gesture it couldn't be that way, it could clear the importance of gesture by its movement. Dynamic gesture is more practical as compared to static gesture, despite the fact that it has more troubles. Analysts have built up the variety of strategies that are, Vision-based, depth-based gloved based.

Gloved-based hand recognition is too embarrassing while at the same time making the interface, while the Vision-based is a comfortable experience however it buckles down in terrible conditions [2]. Be that as it may, in the depth-based it is invaluable; it has the 3D data about the hand dimension [3]. Hence it brings about high preparing rate and accuracy, yet depth camera based on different advancements, for example, time of flight [TOF], 3D laser scanning is too much costly so its convenience is constrained.

## II. ABOUT HAND GESTURE

Hand gesture is high reasonable non-verbal communication which can be started through the focal point of palm, finger position and shape [5]. Gestures are contains static and dynamic hand gestures. As the name, it is plain as day, static means the steady state of hand, and dynamic gesture made out of arrangement of hand movements. Gesture has the decent variety in hand movement as per time and background; it fluctuates from individual to individual. Hand gesture implies all the mix of gestures and movements which is delivered by the hand. The fundamental distinction amongst posture and gesture is that posture has more emphasis on the state of hand while gesture has more emphasis on the hand movement [6] [7].

## III. BASIC THEORETICAL CONSIDERATION

A generalized block outline of gesture recognition framework is appeared in fig 1.

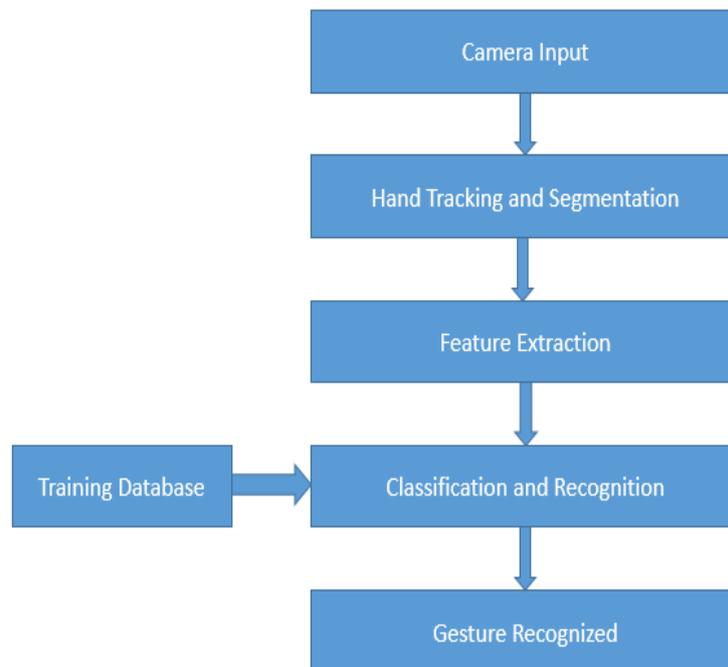


Fig. 1. Basic Hand Gesture Recognition Framework Workflow

Image acquisition is the essential advance in gesture recognition framework. An arrangement of image frames are captured by a less expensive camera. Segmentation of hand is the required to track the movement of the hand. Segmentation segment the image into its objects and locale of enthusiasm from the virtual condition. Autonomous segmentation is one to the most troublesome errand in digital image handling. Hand tracking is a high resolution system that is utilized to know the continuous position of hand. After the effectively hand tracking and segmentation is done there is the need to separate the vital feature focuses in that portioned image. In the wake of getting the extracted features of hand, classifier and recognizer assumes a noteworthy part in gesture recognition framework. Classification and Recognition of the framework where input features are compared with features of the trained database, which brings about gesture recognition.

## IV. METHODS OF HAND GESTURE RECOGNITION SYSTEM

### A. Pixel to Pixel Comparison

This method includes the pixel by pixel comparison of the frame captured and with the image database. This method isn't so exact yet simple to execute. Pre-essential to the comparison image ought to be divided out from the virtual environment. This should be possible by choosing the edge utilizing Otsu's method [4].

### **B. Edges Method**

The target of this method is to discover the most elevated angle in an image and this is found by applying the edge in the gradients. Edge will evacuate the low size gradients. The extent of slope is the sum of derivatives in x and y bearings [4].

### **C. Using Orientation Histogram**

Orientation histogram is subject to the feature vectors, brings about development of histogram based on the edges of image. In the first place the framework is trained with the images. As images are captured by the webcam as the information these images is changed over to the dark scale and from this the histogram is made which is utilized as the training pattern. There onwards similar advances are taken after for recognition i.e. capture of image, transformation to dim scale and histogram count. The benefit of this method is that it is quick, hearty and interpretation invariant but the disadvantage is dependent on rotation [4]

### **D. Thinning Method**

So as to discover the histogram of image the focal point of image is taken as the reference. Expecting the window at the focal point of the image, which is in RGB design should be changed over to YCbCr. There is a range of Cb and Cr. On the off chance that the pixel is in the predetermined range, at that point it ought to be changed over to white pixel rest of the pixel are swung to black. Results in the yield image as a dim scale image; following stage is to change over this dim scale image to parallel which is finished by choosing the edge utilizing the Otsu's method. In this way the double is then thinned. While experiencing this strategy, clamor and unwanted fragments added to it. So those noise are should to be expelled.

## **V. LITERATURE SURVEY**

In this section we presents existing work done in the field of hand gesture recognition.

X. Jiang et al. [8], In recent years, the improvement of human-computer interaction (HCI) methods is quick and the common application is the gesture interaction innovation. This paper proposes a helpful and powerful unique gesture recognition technique. The initial step is to identify hand in each image frame acquired from a USB camera, through skin segmentation and hand feature extraction. Hand area is sectioned in light of YCrCb shading space and identified by recognizing the quantity of fingers.

T. Zhang et al. [9], With the quick development of human-computer interaction technology, gesture recognition winds up one of the key advances of human-computer interaction. In this paper, we propose another technique for dynamic hand gestures recognition. The technique embraces the hierarchical identification demonstrate for dynamic hand gestures recognition.

S. Masood et al. [10], Sign language provides hearing and speech impaired people with an interface to speak with society. Unfortunately, most people do not comprehend sign language. For this, image preparing and desigpattern recognition can give a fundamental apparatus to identify and make an interpretation of sign language into vocal language. This work exhibits a technique for identifying, understanding and making an interpretation of sign language gestures to vocal language. Microsoft Kinect is the essential tool used to capture video stream of the client. This is accomplished by getting skeleton frame from Kinect and afterward removing joints of interest.

Nasri, S et al. [11], A novel approach is proposed for the recognition of moving hand gestures in view of the portrayal of hand movements as counter based similarity images (CBSIs). The CBSI was built by calculating the similarity between hand contours in various frames. The input CBSI was then coordinated with CBSIs in the database to perceive the hand gesture. The proposed continuous hand gesture recognition algorithm can at the same time partition the ceaseless gestures into incoherent gestures and recognize them.

Li H et al. [12], Visual hand-gesture recognition is in effect progressively wanted for human-computer interaction interfaces. In many applications, hands just possess around 10% of the image, though its the vast majority contains foundation, human face, and human body. Spatial localization of the hands in such situations could be a testing assignment and ground truth bounding boxes should be accommodated preparing, which is typically not open. In any case, the area of the hand isn't a requirement when the criteria are only the recognition of a gesture to command a consumer electronics device, for example, mobiles phones and TVs. In this paper, a deep convolutional neural network is proposed to straightforwardly classify hand gestures in images.

TABLE I. Comparison of various existing mechanisms

Ref.	Image Dataset	Continuous /Isolate Gesture	Finding	Features Extraction	Recognition Method	Recognition rate
[8]	Real time images	Isolated	Author propose a dynamic gesture recognition method that can be used in the field of human-Computer Interaction. The method is robust enough to track hand under the complex background and recognize the gesture trajectory in Real time.	Hand shape, No. of fingers	HMM	-
[9]	10 dynamic grasp gestures	Continuous	Author adopt fusing frame images method, convert the recognition of dynamic gestures to the recognition of static fusing frame images. Thus the gesture recognition rate is improved effectively	Density distribution feature	Hausdorff distance, Fingertip detection	90%
[10]	Video frame	Continuous	Author presents a method for detecting, understanding and translating sign language gestures to vocal language. Microsoft Kinect is the primary tool used to capture video stream of the user.	Joint of interest	Dynamic Time Wrapping	91%
[11]	Sample gesture frame	Continuous and isolated	Author proposed algorithm can recognize disjointed and continuous gestures with no restrictive assumptions about the additional motion of the hand between disjointed gestures. The algorithm is also insensitive to the additional motion of the hand at the start and end of disjointed gestures.	SIFT (Scale Invariant Feature Transform) featur	Template matching	91.3% for isolated gestures and 90.4% for continuous gestures.
[12]	40 people, each with 7 different hand gesture	Continuous	a deep convolutional neural network is proposed to directly classify hand gestures in images without any segmentation or detection stage that could discard the irrelevant not-hand areas.	Hand region shrinking	CNN	97.1%

## VI. CONCLUSION

In today's world, people are demanding the evolution of touch to touch less technology. The Natural User Interfaces are simple and easy to use, but very difficult to implement. In this paper, vision-based approaches for dynamic gesture recognition techniques have been reviewed. This is a very challenging research area and comparatively a less work has been carried out then static gesture recognition till now. A satisfactory result can be found only under controlled environment. Recognition of dynamic gestures compared to static gestures needs more computation.

More stress should be given to build up a dynamic gesture recognition system which gives satisfactory performance. From the comparative analysis of some papers on dynamic gesture recognition it is observed the scope towards this direction could be gesture segmentation or gesture spotting from video. Another direction could be to develop efficient algorithm for extraction of relevant features and feature selection that leads to good recognition. From the survey it is observed that there is lack of proper

dataset of dynamic gestures which hinders to measure the effectiveness of the research compared to other's methods. So developing proper dataset could extend research in this area.

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