

# A Statistical Approach for 3D Hand Gesture Recognition

Venkat Raman B<sup>1</sup>, S Gupta<sup>2</sup> and Mohmmad Akram Pasha<sup>3</sup>

Lecturer, CSE department, RGUKT Basar, Hyderabad, India<sup>1</sup>

Student, CSE department, RGUKT Basar, Hyderabad, India<sup>2,3</sup>

**Abstract:** In our daily life, gesture plays most important role and in order to convey data and motions of human being. The process of main aim is Hand gesture recognition can be seen as a way for computers to begin understand human body language, thus building a richer bridge between machines and humans. Current focuses in the field is recognition the hand in whole object and which can be used as a command by user. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. This paper presents a some works on 3D hand gestures motion without using sensors. We first review the how to recognize the hand gesture by using HAAR features. Then, we review the research for 3d hand gesture recognition.

**Keywords:** Hand detection, hand identification, motion detection, input image, training data base.

## 1. INTRODUCTION

Gestures have been one of the important interaction media in current human-computer interaction(HCI). HCI is one of the most popular technique of science. People are trying to make the human life easier by putting their intelligence into machine. As a result almost in everyday we are getting new device which helping our regular life. These application most useful for blind and physically challenged people and not only physically challenged people, but also for different applications in diversified areas such as aviation, surveying, music directions etc. It is best method to interact with the computer without using sensors and any other devices. Main advantage of this project is very easy to use, natural and initiative [1].

## 2. HISTORICAL BACKGROUND

The History of hand gesture recognition for computer control started with the invention of glove based control interfaces. Researches realized that gestures inspired by sign language can be used to offer simple commands for a computer interface. This gradually evolved with the development of much accurate accelerometers, infrared cameras and even fibreoptic bend-sensors(optical goneometers). Some of those developments in glove based systems eventually offered the ability to realize computer vision based recognition without any sensors attached to the glove. Over past 25 years, this evolution has resulted in many successful products that offer total wireless connection resistance to the wearer[4].

## 3. PROPOSED METHOD

**3.1 Architecture of the System:** The system contains a training data set which contains information about the known hands. Dimension reduction or feature extraction is done both on training [6] data set and input query (test image). The obtained low dimensional feature vector is

projected into a classifier which has a capability to compare and discriminate the features.

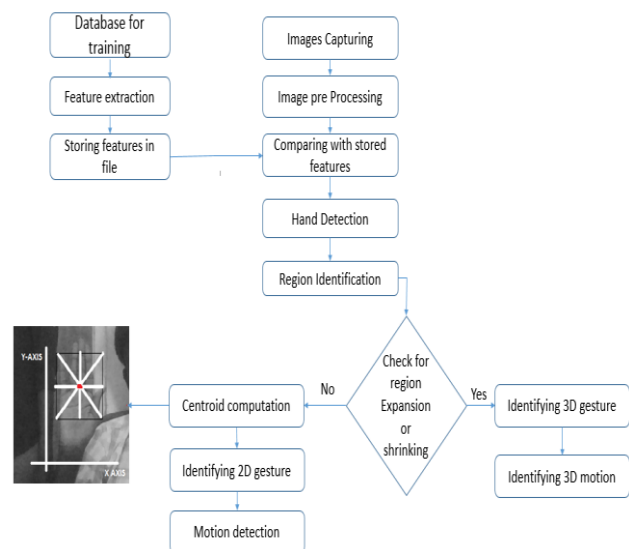


Figure : 1

**Images Capturing:** Capturing sequence of images from web camera.

**Image pre processing:** Captured images convert into grayscale to improve performance and resize all images to a fixed size.

**Hand Detection:** A simple rectangular Haar-like feature can be defined as the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. This modified feature set is called 2-rectangle feature. The values indicate certain characteristics of a particular area of the image. Each feature type can indicate the existence (or absence)

of certain characteristics in the image, such as edges or changes in texture. By using haar features checking for hand in input images.

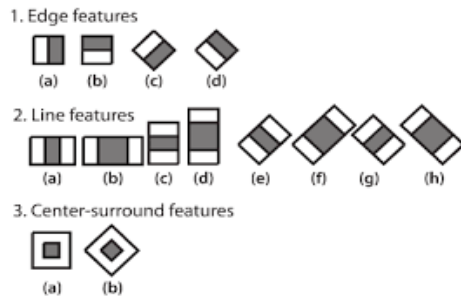


Figure : 2 ref[11]

**Region Identification :** Once a hand is detected , identify the region of hand in a rectangular shape .The  $X_{max}$  ,  $X_{min}$  ,  $Y_{max}$  ,  $Y_{min}$  are noted for the entire sequence of images .



Figure :3

**Check for region expansion or shrinkage:**

In the sequence of images to find whether there is expansion or shrinkage will be checked based on x & y axes . If  $X_{max}$  ,  $X_{min}$  ,  $Y_{max}$  ,  $Y_{min}$  are gradually decreasing then it is identified as shrinkage .If  $X_{max}$  ,  $X_{min}$  ,  $Y_{max}$  ,  $Y_{min}$  are gradually increasing then it is identified as expansion. .If only X –axis changes and Y-axis constant it is known as horizontal rotation vice versa vertical rotation also identified [11] .

**Identifying 3-D gesture:** By above conditions if shrinkage is present then its known as backward motion and expansion indicates forward motion and rotational also identified .

**Centroid Computation :** If no expansion or shrinkage found then we have to compute the centroid for hand region in every input images [fig.1].Centroid will be calculated based on rectangular box length.

**Identifying 2-D gesture:** Connecting all centroid points in a fixed size plain image to identify 2-D direction.

**Motion Detection:** After making a line in a plain image based on difference between x & y axis it will be identified as vertical or horizontal moment after that based

on last centroid point it will identify the direction up ,down or left ,right.

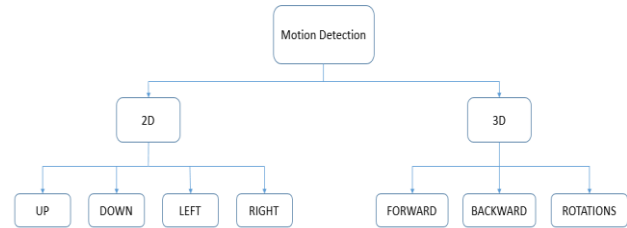


Figure : 4

**3.2 Implementation:**

The Java Media Framework (**JMF**) is a Java library that enables audio, video and other time-based media to be added to Java applications and applets and this we are capturing images and used version is 2.1.5.0.

**OpenCV (Open Source Computer Vision)** is a open source library of programming functions mainly aimed at real-time computer vision ,originally developed by Intel .With these we are training haar classifier and converting images into gray scale and identifying hand region and used version is 9.20.0.0.[7]

Java development kit (JDK) is used for identifying motions and used version is JDK7.

**4.CONCLUSION**

Our proposed method is simple mechanism for hand recognition. It works effectively and is a combination of various existing methods proposed for the process. However ,to reduce the complexity in identification and verification process , that is ,less training samples and easy comparison at a faster speed and less space complexity ,various methods are being experimented. It leaves a scope for research in this area.

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**BIOGRAPHIES**

**Venkat Raman B**, is working as teaching faculty in the department of Computer Science and Engineering, Rajiv Gandhi University of Knowledge Technologies-Basar, India. His passions include teaching, seminars and conducting workshops. His research interest

is in the area of data mining and machine learning.



**Samayamantula Gupta** is an undergraduate student at Rajiv Gandhi University of Knowledge Technologies-Basar, India. His passions include developing innovative software. His research interest is in the area of data mining and machine learning.



**Mohmmad Akram Pasha** is an undergraduate student at Rajiv Gandhi University of Knowledge Technologies-Basar, India. His passions include developing innovative software. His research interest is in the area of data mining and machine learning.