

## Hand Gesture Recognition using CRF

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**Abstract** — During past few years, human hand gesture for interaction with computing devices has continues to be thriving area of research. Hand Gesture Recognition system received great attention in recent years because it provides human computer interaction and sign language. Hand Gesture Recognition is contained three stages: Pre-processing, Feature Extraction and Classification. Most current approach is based on the static hand gesture recognition Hand gesture recognition is often too sensitive to poor resolution, environment of background, occlusion among other prevalent problems and recognition dynamic hand gesture. In existing approach is based on the static hand gesture recognition. So, proposed work investigates dynamic hand gesture recognition using Conditional Random Field. The experiment result shows the static hand gesture recognition and dynamic hand gesture recognition.

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### I. INTRODUCTION

Image Processing is a deal with Pictorial information for human interpretation and examine. Image Processing basically includes three steps viz, importing the image with optical scanner or by digital photography, analysis and manipulating the image and output is the last stage in which result can be altered image that is based on image analysis. Image Processing usually refers to digital image processing for different task. Image Processing is using knowledge about image content like input and output rectangular matrices, Then Compression, noise filtering edge extraction, image sharing, image segmentation etc.

Digital Image Processing formed of a finite number of elements, such as picture element, image elements and pixels, each of which has Particular location and values. Digital Image processing methods stamps from improvement of pictorial information and processing of image, transmission and autonomous machine perception. [2]

Image Processing closely related to computer vision. Computer vision is the construction of explicit, meaningful description of tangible and visible entity from their image. Sub Area of Computer vision includes reconstruction, event detection, gesture recognition, motion estimation, Detection etc. [1] Image Segmentation is the process of Partitioning of image in to its constituent components and meaningful regions according to their identical set of properties or attributes. Segmentation play large role in gesture recognition.

Gesture Recognition is in Computer science and language technology with goal of interpreting human gesture via method and algorithms. Hand Gesture Recognition is one of the very active research areas in the Computer vision field. Hand gesture is a high practical value body language that its specific meaning is established through our language centre by palm and finger position and shape.

#### 1.1. Problem Statement

In Computer vision, Gesture is basically a part of body and movement of body part which contain information or feeling. There are several applications of hand gesture recognition systems such as sign language recognition, human computer interaction, human machine interaction, controller less video gaming, smart TV, human robot interaction etc.

The surrounding of the hand gesture itself dictates the degree of difficulty hand detection for dynamic hand gesture recognition. Problem occurs during hand gesture recognition:

Existing system recognize only static hand gesture without any frame extraction. The problem here to develop dynamic hand gesture recognition.

- Dynamic hand gesture recognition.
- Errors in edges and boundaries for hand detection.
- Noise problem over segmentation.
- Less Recognition rate or accuracy problems.

#### 1.2. Motivation

Gesture is basically use for Non-verbal communication. Adroit gesture can add to the impact of a speech. Gesture Clarity your ideas or rein force them and should be well suited to the audience and occasion. Sign language recognition has attracted researchers for long because it can provide an opportunity for the hearing and speaking impaired people without need for an interpreter. Gestures are providing great way to communication than other body language. Recent research works have mainly focused on recognition of gesture that has been recorded under static hand gesture. Only few works have been reported for recognition of dynamic hand gesture. So, these are influenced as very much to carry on further work.

### **1.3. Objective**

The main aim to dissertation is to proper Hand gesture recognition to overcome problems and limitations. By using proposed method for recognition proper hand and finally compare the results of the proposed solution to differentiate the performance of our proposed solution and existing solution.

### **1.4. Scope of Dissertation Work**

In, Gesture Recognition existing system recognizes only static hand gesture without any frame extraction. The problem here to develop dynamic hand gesture recognition. So, our scope of dissertation involves the robust and effective method hand recognition to overcome problems. So, achieve same recognition rate is expected in dynamic hand gesture recognition.

## **II. LITERATURE REVIEW**

### **2.1 Concept of Image Processing**

Processing of image is a Signal or image processing for which input is an image such as photo or video frame the output of image processing may be either a set of characteristics or parameter related to the image or image. Before going to Processing an image, it is converted into digital form. Digital form means 0 or 1's data. After converting the image into bit information processing is performed. This processing technique like Image enhancement, Image restoration, Image compression, Image segmentation and Image colour processing.

### **2.2 Image Matching**

We define image matching or image compression as a "Comparing two image" as finding differences or similarities between two image. Differences of two images are may be quantitative or qualitative. Comparing images May be useful if finding difference or similarities is relevant to the problem being analysed.

### **2.3 Image Segmentation**

Segmentation is the process of dividing an image in to multiple parts. This is used to identity objects or other relevant information or data in digital images. There are many different ways to performs image segmentation including: Thresholding methods, clustering methods, transform methods.

A good segmentation is typically one which:

- *Pixels in the same category have similar grey scale of multi variant values and form a connected region.*
- *Neighbouring pixels which are in different categories have dissimilar values.*

Segmentation is often the critical step in image analysis. The point, at which we move from considering each pixel as a unit of observation to working object (or parts of objects) in the image, composed of many pixels. If segmentation is done well, then all other stage in image analysis are made simpler.

### **2.4 Image Recognition**

Image recognition has the potential to transform a picture in to meaningful information. The object recognition problem can be defined as a labelling problem based on models of known objects formally given an image containing one or more object. Object of interest (and background) and a set of labels corresponding to a set of models known to the system, the system should assign correct labels to regions or a set of regions in the image. The object recognitions problems are closely related field to the segmentation problem without segmentation object recognition is not possible.

### **2.5 Basic Theoretical Considerations of Gesture Recognition**

In this modern era computers are being used by a large number of people and its demand is still growing. Gestures are being used in HCI many since many years. Earlier, hardware based gesture recognition was more prevalent. User had to wear gloves helmet and other heavy apparatus. Sensor actuator and accelerometer were used for gesture recognition. But the whole process was difficult in real time environment. Gesture recognition is a mechanism through which a system can understand meaning of any gesture. Hand gesture is a high practical value body language that its specific meaning is

established through our language centre by palm and finger position and shape. [1] Hand Gesture can be sub divided in to two types static and Dynamic as shown in Figure 1.

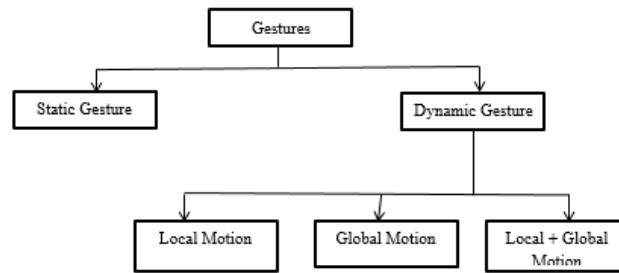


Figure 2.1: Types of Gesture [2]

### 2.2.1 State of Art

In earlier days, hand gesture detection was done using mechanical device to obtain information of the hand gesture. Generally, there are three stages in most of the gesture recognition system. The tree stages may be enumerated as image pre-processing, feature extraction and recognition shown figure 2.

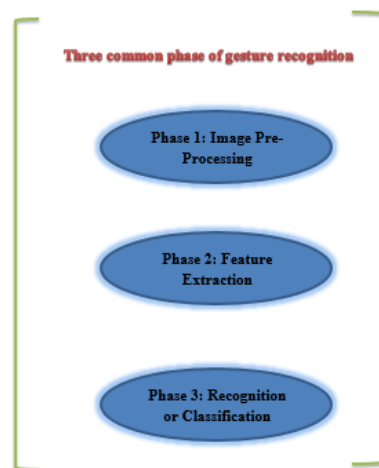


Figure 2.2: Three common stage of gesture recognition system [3]

1) In image pre-processing stage, firstly, the input image is acquired from the capture the image. Then segmentation which partitions an image into its consistent parts or objects. Feature extraction is high resolution technique that is employed to extract the consecutive feature of the hands of the user. After the successful tracking, there is a gesture recognition stage. In gesture recognition or classifier is method that takes feature set as input and gives a class labelled output, which are required output gesture.

Here, I presenting the comparison of the five papers whose literature review had been conducted by me on the basis of few important parameter, which helped me to overcome the problems.

**Table 1: Literature Reviews of five papers**

Paper	Segmentation	Classifier	Pros/Cons
"Novel Segmentation Algorithm for Hand Gesture Recognition", IEEE-2013 [4]	RGB, YCbCr, HSV		<b>Pros:</b> Pros:-HSI model would greatly benefit in order to segment the hand and fingers. <b>Cons:</b> Database require more memory
"Real Time Static Hand Gesture Recognition System in Complex Background that uses Number system of Indian Sign Language", IJARCT-2013 [5]	YIQ	Euclidian Distance	<b>Pros:</b> - different hand shapes and sizes produce more accuracy by using Euclidian distance. <b>Cons:</b> -sensitive to red colour
"Hand Gesture Detection and Recognition Using Principal Component Analysis", IEEE -2013 [6]	HSV	PCA	<b>Pros:</b> - achieve satisfactory real time performance <b>Cons:</b> -Lack of detection ability
"Dynamic Time Wrapping based Gesture Recognition", IEEE-2014 [7]	Depth Data	DTW	<b>Pros:</b> - Detect all gesture, good result <b>Cons:</b> - Less accuracy
"Recognition of Hand Gesture Recognition Using Hidden Markov Model", IEEE-2012 [8]	YCbCr	HMM	<b>Pros:</b> -Easy to understand <b>Cons:</b> - Long assumptions about data

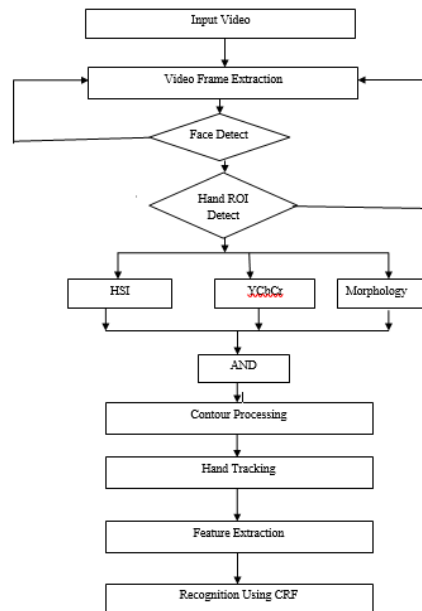
### III. INTRODUCTION OF BASE TECHNIQUE

#### 3.1. Overview of Proposed Work

Gesture recognition is in computer science and language technology with the goal of interpreting human gesture via method and algorithms. Gestures communicate the meaning of statement said by the human being. There are many gesture recognition methods for hand gesture recognition system. All methods have some limitation and problems.

Existing system recognize only static hand gesture without any frame extraction. The problem here to develop dynamic hand gesture. Initially proposed work is working dynamic hand gesture recognition, this proposed work includes the following steps and all these steps are explained below.

#### 3.2. Flow Chart



**Figure.3.1: Proposed work flow chart**

Figure 3.1 shows the flow diagram of dynamic hand gesture recognition. In proposed work first input the video. Video is capture by the web came or camera. Then converted that video into frame. The detect the face using Haar classifier then detect the hand using Region of Intrest. Now in the next steps proposed will use the combination of HSI, YCbCr and morphology instead of only HSI and YCbCr color model use in skin color segmentation. Combinations of these three are background noise reduction and better performance of segmentation.

Then apply contour processing on the output of skin segmentation. Then apply hand tracking using centroid and then apply feature extraction using Euclidian distance. Finally, recognition or classification using Conditional Random Field and get better recognition rate.

#### 3.3. Experiment Parameter

Mainly focus the performance parameter such as Recognition Rate and Time Requirement use under different background condition and hand gesture.

##### Recognition Rate

The recognition rate (RR) is defined as the ratio of the number of correctly classified samples to the total sampling number

$$RR = \frac{R_c}{R_t} * 100$$

Where:  $R_c$  = correctly recognised gesture  $R_t$  = Total recognised gesture

#### 3.4. Expected Outcomes of the Proposed Work

Expected outcomes of proposed work are proper hand gesture recognition in video frame and same recognition rate expected in dynamic hand gesture recognition.

### **3.5. Designed Constraints**

Following are the design constraints that must be satisfied for the solution to a problem.

#### **3.5.1. Minimum Hardware Specification**

Desktop computers with 2.0 GHz Intel(R) Core(TM) 2 Duo processor and 2 GB RAM having Windows xp,7,8 Operating System is required for the working of above proposed work.

#### **3.5.2. Minimum Software Specification**

MATLAB R2013b software must be installed to implement the above proposed work.

## **IV. CONCLUSION**

- *Recently, Gesture recognition is very active area of research. The surrounding of the hand gesture itself dictates the degree of difficulty hand detection for dynamic hand gesture recognition.*
- *Existing work is based on static hand gesture recognition Using CRF. Existing system recognize only static hand gesture without any frame extraction. So, in proposed work based on dynamic hand gesture recognition using CRF.*
- *Experiment results show the static and dynamic hand gesture recognition using CRF.*
- *Recognition rate of static hand gesture is 99% and dynamic hand gesture is also 99%. So, propose work of dynamic hand gesture is achieved better and same as static hand gesture recognition*
- *Propose work is done using only one input video.*
- *In future work apply more input video and result analysis done using experiment parameter.*

## **V. FUTURE WORK**

Of all the issues that I have gone through. Among them Security issues and Energy management issues are the major issues. While reading into its intricate details, I personally believe that can be more improved to what it is now and by doing this would like to contribute to further enhancements of the technologies making them more infallible. As future work, we will investigate several Cloud environments and propose new optimization policies which will minimize the CO2 emissions of Cloud environment, we will integrate energy cost rate into our new models in differing environmental impact and to minimize the total energy cost.

## **REFERENCES**

- [1] Jaya, Ashutosh, "A Method for Hand Gesture Recognition", International Conference on Communication System and Network Technology, IEEE, pg. 919-923, 2014.
- [2] Siddharth S. Rautary; Anupam Agarwal, "Vision based hand gesture recognition for human computer interaction: a survey", Springer Science + Business Media Dordecht 06-nov-2012
- [3] Siddharth S. Rautaray; Anupam Agrawal, "Real time hand gesture recognition system for dynamic application", International Journal of UbiComp (IJU), Vol.3, No.1, January 2012, DOI:10.5121/iju.2012.3103
- [4] Dhruva N.; Sudhir Rao; RupanaguSachin; S.K., Sthuthi B.; Pavithra R.;Raghavendra, "Novel