International Journal of Engineering and Technical Research (IJETR)
ISSN: 2321-0869, Volume-2, Issue-3, March 2014

Hand Gesture Recognition for HCI (Human - Computer Interaction) using Artificial Neural Network

Gaurav Bidgar, Mangesh Autade, Pankaj Marathe, Shainesh Aher

***Abstract*— Day by day lots of efforts are been taken towards developing an intelligent and natural interface between computer system and users. And looking at the technologies now a day's it has become possible by means of variety of media information like visualization, audio, paint etc. Gesture has become important part of human communication to convey the information. Thus In this paper we proposed a method for HAND GESTURE RECOGNIZATION which includes Hand Segmentation, Hand Tracking and Edge Traversal Algorithm. We have designed a system which is limited to the hardware parts such as computer and webcam. The system consists of four modules: Hand Tracking and Segmentation, Feature Extraction, Neural Training, and Testing. The objective of this system to explore the utility of a neural network-based approach to the recognition of the hand gestures that create a system that will easily identify the gesture and use them for device control and convey information instead of normal inputs devices such as mouse and keyboard.**

***Index Terms*— Hand Gesture Recognition, Artificial Neural Network, Hand Segmentation.**

I. INTRODUCTION

With the tremendous demands of computer in society, HCI (Human Computer Interaction) has become important part of our day to day life. It is the mostly thought as the computing, communication, and displays the technologies progress even further. The existing HCI technologies may become weaker in the effective utilization of the available information flow. For example, popular media of HCI is based on the simple mechanical device such as mouse and keyboards. These devices have achieved large popularity but they are being limited by the speed and naturalness with which they interact with the computer. Thus in the current years, the detection and recognition faces and hand gesture devoted the field if computer vision.

This research has leaded huge potential in application such as telemedicine, teleconferencing and advanced interface for HCI. In general hand gesture is a way of interact with the system in such a way that communication perform with the natural part of our body. Mostly the complex task is recognition of gesture which includes various aspects such as motion analysis, motion modelling, recognition pattern and etc. As we know that natural Human Computer Interaction (HCI) is the necessity of today's world. From the study of survey and sign languages it defines that hand gesture is most easy and natural way of communication where real time vision-based hand gesture recognition is proving to be more flexible for human computer interaction. Hand tracking and segmentation are found to be most challenging aspects in real time vision based Hand Gesture. To increase the speed of achieving hand tracing and segmentation various researchers are working. The aim of this work is to overcome the vision based challenges, such as dynamic background removal, variable lighting condition, skin color detection for HCI.

Manuscript received March 10, 2014.

Gaurav Manik Bidgar, Computer Engg., Pune University, Pune, India.
Mangesh Balasaheb Autade, Computer Engg., Pune University, Pune, India.
Pankaj Ramesh Marathe, Computer Engg., Pune University, Pune, India,
Shainesh Datta Aher, Computer Engg., Pune University, Pune, India.

II. ARTIFICIAL NEURAL NETWORK

A. *Neural Network*

An artificial neural network is a system of processing information which has certain features in common with biological neural networks. ANN (Artificial Neural Network) has been developed on basis of following assumption.

a) Processing of information is carried on by using multiple simple elements called by neurons.
b) In this process of using connection links are used to parse the signals between neurons.
c) Where each connection links has its own associated weight.

B. *Related Works*

The use of hand gestures provides an easy an attractive, alternative interface to devices for human-computer interaction (HCI). In this paper, we are proposing a new method for static hand gesture recognition.

The following system presented is based on one powerful hand feature in combination with a multi-layer neural network which is dependent on classifier. Here on the basis of segmentation and skin color recognition hand gesture area is separated form the background. Therefore three main Stages on which proposed method is obtain:

a) Pre-processing Stage- In pre-processing stage the image segmentations, smoothing of image and edge detection can be obtained.
b) Feature Extraction Stage- Extraction Feature of the Image use the hand contour of the gesture image.
c) Classification Stage- And finally in multi-layer classification of gesture's feature will be produced and entered to the neural network.

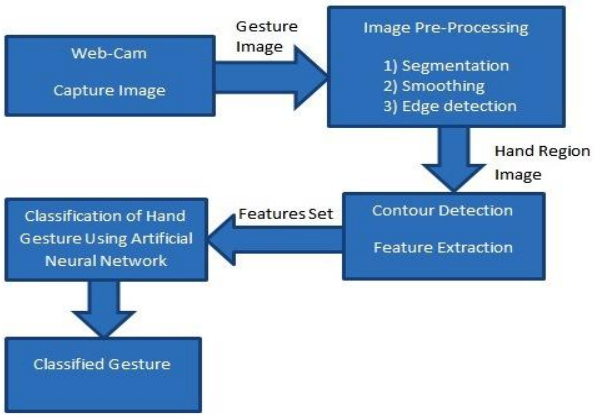

Fig. 1: Block Diagram for Gesture Recognition System.

III. HAND SEGMENTATION

Success key towards any gesture recognition is hand tracking and segmentation and due to obstacles of vision based methods like lighting condition, skin color detection, complex background and etc. Here techniques are introduced for high speed hand detection and segmentation such as:

A. Hand segmentation using Lab color space (HSL)

B. Hand tracking and segmentation (HTS)

Let's see them in detail below.

A. Hand segmentation using Lab color space (HSL):

This algorithm was found for the purpose of detection skin color for complex background.

- HSL Algorithm:

1. Acquiring of image.
2. Study the input image.
3. Converting of RGB image format into lab color space.
4. Calculate threshold value.
5. Acquiring of binary image from the intensity of image.
6. Finally performing erosion operations.

B. Hand tracking and segmentation (HTS):

The aim of this algorithm is to obtain speedy skin color detection and removal of complicated background.

- HTS Algorithm:

1. Acquiring image from web camera.
2. By using comshift function process add frames at the run times.
3. Passing experimental threshold value to the comshift function.
4. Required Hand portion of the image is segmented.
5. Using canny edge detection finds the edges.
6. Erode the Image.
7. Apply edge traversed algorithm to get find image.
8. Stop.

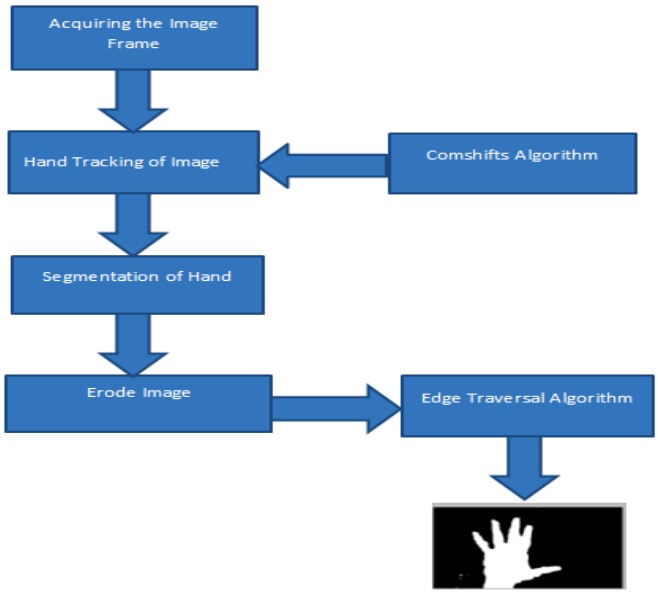

Fig. 2: Hand Tracking & Segmentation

IV. FUTURE SCOPE

Our future work includes, multiple desired, multiple feature vectors for classification and recognition accuracy. The line identification using Hough transform, Fourier descriptor, and image hand moments will be used due to the properties of rotation, scale and translation invariant for extending Geometric features. Further we are extending to manual alphabets, Indian sign language interpretation.

V. CONCLUSION

In this paper we are classifying static hand gesture using various algorithms where only features are that of low-level computation. The good result for background and foreground is obtained by using skin color and segmentation. The main goal of this research is to design a system that will help to interaction between the computer and human through the use of hand gesture as control commands.

REFERENCES

[1] Archana Ghotkar, Gajanan Kharate, "Hand Segmentation Techniques to Hand Gesture Recognition for Natural Human Computer Interaction," International Journal of Human Computer Interaction (IJHCI), Volume (3), 2012.

[2] Rajesh Mapari, Dr. Govind Kharat, " Hand Gesture Recognition using Neural Network", International Journal of Computer Science and Network (IJCSN) Volume 1, Issue 6, December 2012.

[3] Sujeet D. Gawande, Prof. Nitin R. Chopde, "Human Computer Interaction using Hand Gesture Recognition with Neural Network," International Journal of Application or Innovation in Engineering & Management (IJAIEM) Volume 2, Issue 3, March 2013.

[4] Dr. Jane J. Stephan, Sana'a Khudayer, " Gesture Recognition for Human-Computer Interaction (HCI)" International Journal of Advancements in Computing Technology Vol. 2, No. 4, October 2010

[5] Feng-Sheng Chen, Chih-Ming Fu, Chung-Lin Huang, "Hand gesture recognition using a real-time tracking method and hidden Markov models" Image and Vision Computing 21 (2003) 745–758.