HAND GESTURE RECOGNITION BY USING NEURAL NETWORK

[1]*Prof. D. G. Agarwal,* [2]*Jyoti Ashok Mahajan*

[1]*Associate professor Department of ECE, Shri Sant Gadge Baba College of Engineering and Technology, Bhusawal .North Maharashtra University, Jalgaon.*

[2]*Student, Department of ECE .Shri sant Gadge Baba College of Engineering and Technology, Bhusawal-425 201.North Maharashtra University, Jalgaon.*

ABSTRACT: *Hand Gesture is consistently utilized in daily life style. It is so ordinary technique to communicate. Hand gesture recognition technique is extensively used in the application area of managing mouse and/or keyboard functionality, 3D World, mechanical system, Manipulate virtual objects, Human/Robot Manipulation Navigate in a Virtual Environment, and Instruction Communicate at a remote location. This paper initiates a real time hand gesture recognition system. The proposed system include of four phases: image acquisition, feature extraction, and recognition, text to voice conversion. In the image acquisition phase input image of hand gestures are taken by digital camera or web camera in fairly accurate frame rate. In second phase a rotation, translation, scaling and orientation invariant feature extraction technique has been establish to take out the feature of the input image based on moment feature extraction method. Gesture (Gesture) means a association of element of body. Gesture Recognition is the technique that recognizes the movement of any part of body. It recognizes hand, head, arms or some part of the body. Hence the objective of Gesture Recognition is to give interface of human body through computer via mathematical algorithm. This paper provides a real time vision based technique for recognizing human body action using MATLAB. It in addition provides the working features of recognizing procedure utilize Skin detection algorithms and Edge detection.*

KEY WORDS: *Hand Posture, Hand Gesture, Human Computer Interaction (HCI), Segmentation, Feature Extraction, Classification Tools, Neural Networks.*

I. INTRODUCTION

Gesture Recognition identifies significant expression of action by a human body, concerning the hands, face, head, arms, or any part of body. Gesture Recognition is significant in proposing well-organized human computer interface. It's make available a bitter association between machine and human than primitives tent consumer interface or event GUI(graphical user interface). Thus one of the attractive techniques for providing natural human-computer interface is the utilization of the hand as an input mechanism moderately than the cumbersome devices such as mice and keyboards, which require the user to be situated in a specific location to utilize these devices. While human hand is an expressive object, it is an open issue to converse. The mainly imperative thing in hand gesture recognition system is the input characteristics, and the selection of excellent characteristics demonstration. This proposed system presents a analysis learn on the hand postures and gesture recognition techniques, which is well thought-out to be a demanding difficult crisis in human computer interaction circumstance and promising additionally. Various applications and methods were d is cussed at this point through the clarification of system recognition framework and its most important stages. Appearance support technology is utilized for recognizing a gestures. Appear based technology read appearance of image of hand and evaluate this image parameters through the extracted image feature from input video which is taken by web camera. Gesture recognition does not necessitate the user to carry whichever particular equipment otherwise connect any devices to the body. The gestures of the body are interpret by a camera as an alternative of sensors attached to a device. Human band gestures make available the mainly significant denotes for non-verbal interaction surrounded by people. They range from trouble-free manipulative gestures that are utilize to point at and shift objects approximately two additional composite communicative ones that articulate our emotions and permit us to converse through others. Hand gesture recognition support for man-machine interface is being developed dynamically in current years. Due to the effect of lighting and composite surroundings, mainly illustration hand gesture recognition systems work simply under restricted background. Several techniques for hand gesture recognition utilizing visual examination have been recommended for hand gesture recognition. For hand detection, various approached make use of color or motion information. A hand gesture recognition system based on the shape examination of the static gesture. Recognizing gestures is a composite task which involves several characteristics just like motion analysis, motion modeling, even psycholinguistic studies generally pattern recognition and machine learning; gestures can be categorize into static gestures and dynamic gestures. Static gestures are frequently illustrated in phrases of hand shapes, and dynamic gestures are normally illustrated according to hand movements. Gesture recognition system we have

recommended is a step in the direction of expanding a more sophisticated recognition system to facilitate such varied uses as menu-driven interaction, augmented actuality, or still recognition of Sign Language**.**

II. PROPOSED SYSTEM

In the proposed system the communication among human and computer has raise to be an significant element in everyday life. It apprehension with the design, evaluation and accomplishment of interactive computing systems for human utilization. The majorly trendy communicating mechanisms are keyboard, mice, light pen, trackball, keypads etc. The devices are well-known but not so natural for communication. To the improvement of vision-based interface, currently computer can be capable to observe which make the human computer interaction properly. These utilize a new communication and managing capability that is more reliable, time saving, and user-friendly. A number of research work have done on hand gesture recognition based on different processes and techniques. The purpose of this proposed system is to plan a hand gesture recognition system that takes efforts in real-time and recognized manipulative hand gestures. The gestures that are utilized in this recognition system have different meaning. Every one of these gestures corresponds to a particular job.
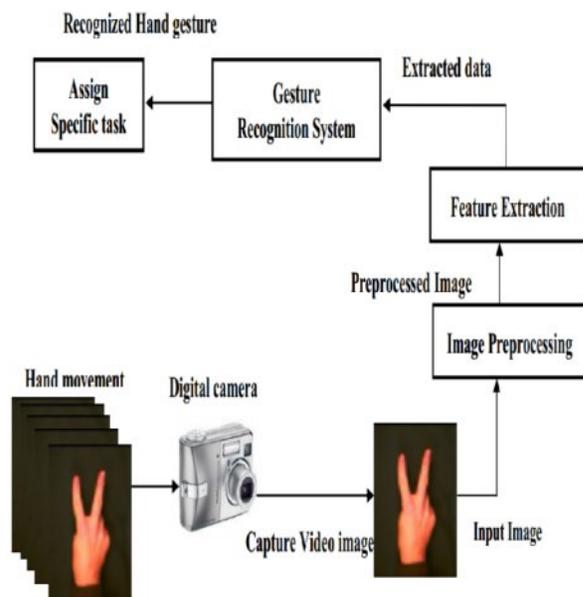

Figure 1: Architecture of the Hand Gesture recognition system

In this proposed paper apprehension to intend a feature extraction technique that is invariant over scaling,

rotation, orientation and translation based on moment feature extraction technique thus that the system be able to recognize hand gestures captured in different orientation or size or angle.

The method proposed in this paper is designed to recognize hand gesture in real-time applications. The technique that is utilized to recognize hand gesture is bases on computer vision. The in general system architecture is illustrates in figure 1.

The complete system of hand gesture recognition separated into five stages:

- *Image Acquisition,*
- *Image Preprocessing,*
- *Feature Extraction*
- *Hand Gesture Recognition,*
- *Text to voice conversion.*

A) INPUT: The input of the gesture recognition is hand gesture image that acquired by a webcam or camera. This is a motion of hand or body part that is captured and develops by edge detection algorithm. Earlier than preprocessing initially we initialize variable and parameters.

B) PRE-PROCESSING: Preprocessing is practically applied to images earlier than we can extract characteristics from hand images. It is a step by step procedure to be acquainted with and matching appearance of the image that is until that time accumulated.

- *STEP 1:* Captured image is a gray scale image translated into corresponding binary form or frames. Ostu algorithm is utilized to convert gray scale into binary form. In computer vision and image processing, Otsu's technique is utilized to mechanically execute histogram shape-based image thresholding or the decrease of a gray level image into a binary image. The algorithm supposes that the image to be threshold includes two classes of pixels or bi-modal histogram (e.g. foreground and background) then computes the finest threshold sorting out those two classes subsequently that their merged spread (intra-class variance) is minimum.
- *STEP 2:* After be appropriating the Otsu algorithm on the original gray scale image, we discover that several noise take place in binary image or frames. These faults produce difficulties in recognition of hand gesture. Thus we require eliminate these faults. Morphological filtering approach is completed to eliminate these faults. In the morphological filtering, we apply a rule on the binary image.

The value of several specified pixel in the result image is acquired by allying set of regulations on the neighbors in the input image.

- **STEP 3:** After discovering the actual binary image characteristics extraction is execute. Characteristics extraction is a procedure of find the edge of detected image. Canny edge detection algorithm is utilized for find the edge of detected image.
- **STEP 4:** The detected edge of image is used to match the appearance of hand gesture and give the result to the output hardware or media application.
- **STEP 5:** After recognition of gesture output will be given to text to speech converter module as input then it will convert text into voice.

III. GESTURE RECOGNITION

Gestures are expressive, meaningful body motions – i.e., physical movements of the fingers, hands, arms, head, face, or body with the intent to convey information or interact with the environment.
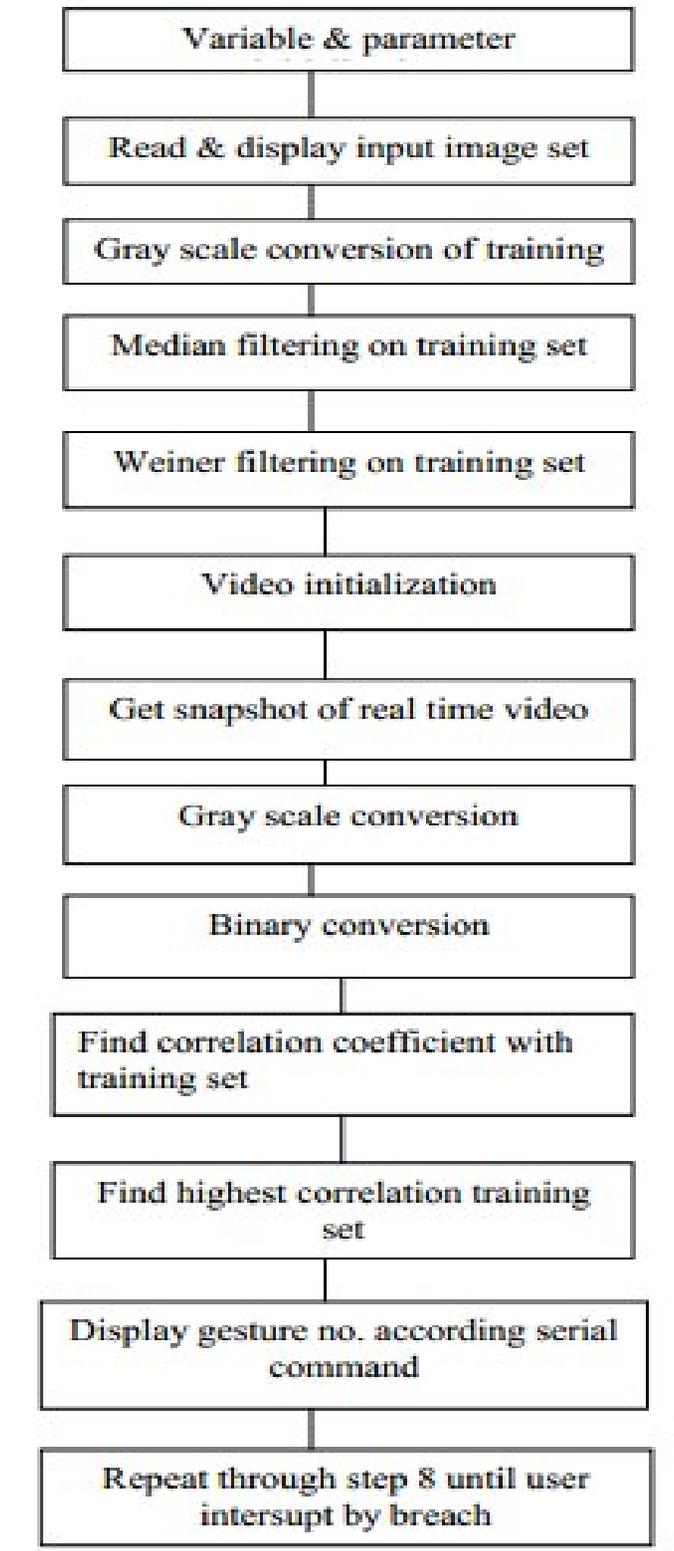
There are several aspects of a gesture that may be relevant and therefore may need to be represented explicitly. Hummel's and Stappers describe four aspects of a gesture which may be important to its meaning.

- **Spatial information** – *Where it occurs, locations a gesture refers to.*
- **Pathic information** – *The path that a gesture takes.*
- **Symbolic information** –*The sign that a gesture makes*
- **Affective information** – *The emotional quality of a gesture.*

In order to infer these aspects of gesture, human position, configuration, and movement must be sensed. Gesture recognition is the process by which gestures made by the user are made known to the system. Gesture recognition is also important for developing alternative human -computer interaction modalities.
It enables human to interface with machine in a more natural way. Gesture recognition is a technique which used to take computers „see" and interpret intelligently is becoming increasingly popular. Dynamic gesture recognition isn't something entirely new.

IV. FLOW OF PROPOSED SYSTEM


```
┌─────────────────────────────┐
│   Variable & parameter       │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│  Read & display input image set │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Gray scale conversion of training │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│  Median filtering on training set │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│  Weiner filtering on training set │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│     Video initialization     │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Get snapshot of real time video │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│    Gray scale conversion     │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│     Binary conversion        │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Find correlation coefficient with │
│       training set            │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Find highest correlation training │
│            set                │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Display gesture no. according serial │
│        command               │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│ Repeat through step 8 until user │
│     intersupt by breach       │
└─────────────────────────────┘
```

V. EXPECTED RESULT

Many attempts to recognize static hand gestures shapes from images [16] achieved fairly good results, but this is mainly due to either very high computation or the use of specialized devices. One such attempt is that of Driesch and Malsburg how have achieved good recognition rate (86.2%) using the Elastic-Graph matching technique to classify hand postures against complex backgrounds. The aim of this system is to achieve relatively good results but at the same time a trade off must be considered between time and accuracy. However we will aim to achieve very good accuracies.

We use the following equation to find the correct recognition rate

$$Correct\ Recognition\ in\ \% = \frac{Correct\ Recognition}{Total\ Frames}$$

And find the error rate by using following equation:

$$Error\ Rate\ = \frac{False\ Recognition}{Total\ Frames}$$

Hence it would be more efficient if the system could learn only the faulty detected gestures by interaction with the user. Sometime default frames are captured by the system. In this case the system cannot recognize hand gestures. System focuses on the three areas. They are-the system can detect and extract human hand from complex image that is an image where a human body is appeared, modify the system so that it can work in any lighting condition and expand the system to recognize the hand tracking.

VI. CONCLUSION

This propose a technique of organizing static hand gestures using hand image contour wherever the only characteristics are that of low-level computation. By using Skin color segmentation provide good results for isolate foreground from background This technique robust against parallel static gestures in different light conditions. The most important objective of this research is to expand a system that will aid in the interaction among human and computer through the use of hand gestures as a control commands. a new solution was proposed to identify hand gesture. The system consists of the following process: hand detection, pre-processing, features extraction, network training and identification. The focus of this research is selecting the features which can classify different gestures, so the main advantage of this system is that it takes low computational cost features for identification, and our system is easy to install and can execute in real-time. However, some limitations still need to be overcome to make this method more effective, such as for differentiating significant gestures or supplement characteristics to distinguish some gestures often mistaken ("G" is sometimes recognized as "A", "D"). Using additional features is also a subject to be explored in the future work.

REFERENCES

[1] S. Lenman, L. Bretzner, and B. Thuresson, "Computer vision based hand gesture interfaces for human –Computer interaction,"Department of Numerical Analysis and Computer Science, June 2002.

[2] A. Malima, E. Ozgur, and M. Cetin, "A fast algorithm for vision-based hand gesture recognition for robot control," IEEE Conference on Signal Processing and Communications 2006, pp. 1-4, 2006.

[4] M. Marshall, "Virtual sculpture - Gesture controlled system for artistic expression,"in Proc. of the AISB 2004 COST287 - ConGAS Symposium on Gesture, Interfaces for Multimedia Systems, Leeds, UK, pp. 58-63, 2004.

[5] M. M. Hasan and P. K. Mirsa, "Brightness factor matching for gesture recognition system using scaled normalization,"International Journal of Computer Science & Information Technology (IJCSIT), vol. 3, no. 2, 2011.

[6] V. S. Kulkarni and S. D. Lokhande, "Appearance based recognition of American sign language using gesture segmentation," International Journal on Computer Science and Engineering, vol. 2, no. 3, pp. 560-565, 2010.

[7] Bauer & Hienz,‖ Relevant feature for video-based continuous sign language recognition‖, Department of Technical Computer Science, Aachen University of Technology, Aachen, Germany, 2000.p. 440 – 445.

[8] Starner, Weaver & Pentland, ‚‖Real-time American Sign Language recognition using a desk- and wearable computer-based video‖, in proc. IEEE transactions on Pattern Analysis and Machine Intelligence, 1998, p. 1371-1375.

[9] L. Fausett, "Fundamentals of Neural Networks, Architectures, Algorithms, and Applications", Prentice-Hall, Inc. 1994, p.304-315.

[10] K.Murakami, H.Taguchi, ‖ Gesture Recognition using Recurrent Neural Networks, in CHI '91 Conference Proceedings ACM. 1991, p. 237-242.

[11] G. Joshi, and J. Sivaswamy, "A simple scheme for contour detection", 2004, p. 236-242.

[12] (1998),Hans-Jeorg Bullinger Human-Computer Interaction[online],available, http://www.engadget.com.

[13] G. Awcock, and R. Thomas, "Applied Image Processing. ", Acmillan press LTD, London1995, p.1281 - 1284

[14] Vladimir I. Pavlovic, Rajeev Sharma, Thomas S Huang, ―Visual Interpretation of Hand Gestures for Human-Computer Interaction: A review‖ IEEE Transactions of pattern analysis and machine intelligence, Vole 19, NO 7, July 1997, pp.677 - 695

[15]   Davis & Shah‖ Visual gesture recognition‖, in proc. IEEE Visual Image Signal Process, 1994, vol.141,Issue:2,p. 101 – 106.

[16] ―Hand gesture Recognition of Radial Basis Functions (RBF) Networks and Decision Trees "International Journal of Pattern Recognition and Artificial Intelligence. Volume: 11, Issue: 6 1997 pp. 845-850.

[17]   Face detection in complicated backgrounds and different illumination conditions by using YCbCr color space and neural network Pattern Recognition Letters, Volume28, and Issue 16, 1 December 2007, Pages 2190-2200.