

Recognize Number of fingers from Single hand gesture Image using Image processing and Neural Network

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ABSTRACT-Objective of proposed research is to recognize total number of fingers from hand gesture image. This kind of system is very useful for mute people who can communicate through computer with others. This research paper defines proposed methodology for recognition of total fingers from hand gesture image. Images are processed by various image processing functions in MATLAB 2018. After extraction of features, finally recognition is done through Neural Network classification algorithm. For testing, 100 different images of hand gesture have taken from different people. Average result accuracy is 92%.

KEYWORDS: Neural Network, Matlab, Feature Extraction

I. INTRODUCTION

Today's, a computer is popular communication medium among humans. One person can interact with other person through computer by expressing his body language. This kind of system is very useful for deaf & dumb people. This type of people can able to communicate nonverbally. Body language like face gesture and hand gesture are used by dumb people to express their thoughts. Today's computer can recognize people, animal, vehicle or any kind of object. Camera and sensor based system are very useful today to detect & track object. Up till literature of recognition can be done by two ways: Image based & Sensor based [1].

Because of low cost & high configuration computers, image (vision) based technology is very popular today. In this research, proposed technique is use for counting number of fingers from image. A Gesture is categorized into two distinctive categories Dynamic and Static [2]. Proposed technique requires static gesture images.

II. RELATED STUDY

Jean-Francois collumeau proposed the simulation of gesture based remote control interface intended for operating rooms. They provide vision-based surgeon-computer interaction simulator has been introduced in this paper. System define

image processing for virtual surgical lighting arm and a graphical interface [3].

Asanterabi Malima et al. developed an algorithm for recognizing a limited set of gestures from hand images for a robot control application. 1D binary signal is extracted by tracking the circle. By counting number of zero to one transition in this 1D signal and subtracting one leads to the estimated number of fingers active in the gesture [4].

Yikai Fang et al. proposed a real time hand gesture recognition method. In this method, they reduced the computation expense by detect multi scale feature across binary image and make hand gesture interface more practical by combine this feature detection with hand tracking and segmentation. Altogether this method combines fast hand tracking, hand segmentation and multi-scale feature extraction to develop an accurate and robust hand gesture recognition method [5].

Tasnuva Ahmed presented a neural network based real time hand gesture recognition system. They have explained the whole system of hand gesture recognition in four phases. Image acquisition; Image processing, Feature Extraction and HGR. Feature extraction method can recognize hand gestures captured in different angle or orientation or size. As

Artificial Neural Network is used to recognize the hand gesture [6].

Mithun G Jacob et al. presented a method for surgical instrument handling and retrieval in Operating Room with a multimodal Robotic assistant. They have used a Microsoft Kinect sensor to acquire depth information used to segment the hand and localize the fingertips. 3D trajectory of the fingertips is used to classify the dynamic gesture, smoothed with Kalman filters and then quantized for classification with a set of Hidden Markov Models (HMM) and they have used a microphone with the CMU Sphinx to recognize speech commands. The command is sent to robotic arm across the network to deliver the instrument [7].

Meenakshi Panwar and Pawan Singh Mehra , show in “Hand Gesture Recognition for Human Computer Interaction”, the hand gestures are taken by a camera. Image transformations are carried out on the rgb image to convert into ybcr image. The ybcr image transformed into binary image. Edge detection algorithm is used to find the edges in the image. By making use of edge detection the orientation of hand is detected. The features like centroid, peaks detection, Euclidean distance and thumb detection are found. The success rate is 92% with computation time 2.76 seconds. The algorithm is implemented in MATLAB [8].

Zhong Yang, Yi Li, Weidong Chen, Yang Zheng, in “Dynamic Hand Gesture Recognition Using Hidden Markov Models”, make use of HMM based method to recognize the hand gestures with non uniform background. The input images are taken by a camera. Skin color is used for segmentation. The gestures are splitted by making use of spotting algorithm. They use data aligning algorithm to align features with success rate of 100% [9].

Amiraj Dhawan, Vipul Honrao , proposed “mplementation of hand detection based techniques for human computer interaction”, in which they presents number of methods for segmenting an image and thresholding with and without background. Author presented tutorial on openCV for hand detection[10].

Ankit P. Parmar, Dr. Nehal G. Chitaliya have proposed smart phone application in “Gesture Recognition System for Indian Sign Language on Smart Phone” where they has used 26 alphabets and 10 digits with their respective gestures. They have used Android with opencv technology [11].

III. PROPOSED SYSTEM MODEL:

Proposed model categorized into three parts:

- A. Image Processing
- B. Feature Extraction
- C. Recognition

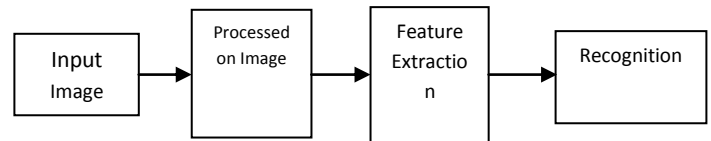


Figure 1: Basic Diagram of Recognition System

A. IMAGE PROCESSING

Proposed method considers for single hand gesture where hands gesture taken as image by camera. Methodology implemented in Matlab. Following figure shows the various steps to process the image.

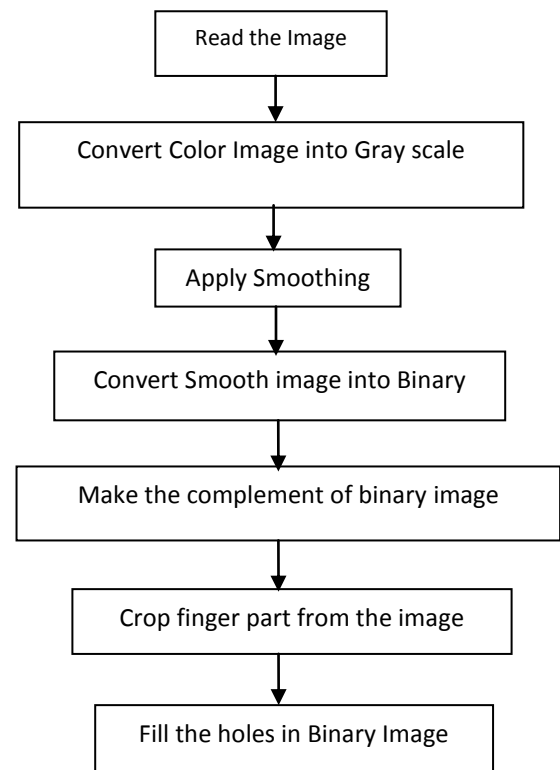


Figure 2: Flow chart of Implemented Pre-Processing Methods

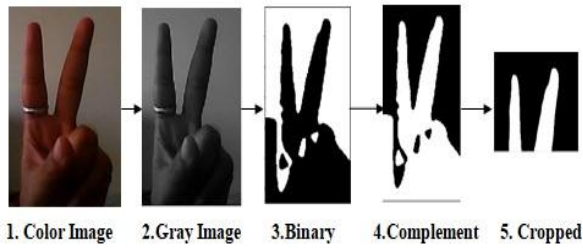


Figure 3: Samples of total finger counting number “two”

B. FEATURE EXTRACTION

As following figure 4, boundary method is applied to find the features from the image. Cropped image contain only fingers and individual fingers consider as distinct object. Boundary method traces the region of the each object on cropped image (as shown in figure 5) and count number of boundaries. Proposed technique count number of distinct boundary as feature.

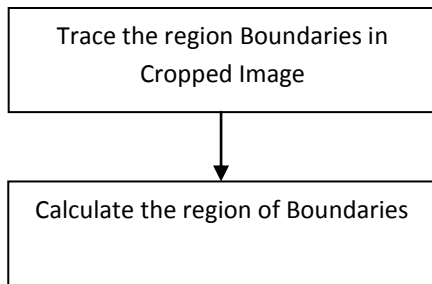


Figure 4: Flow chart of Feature Extraction technique

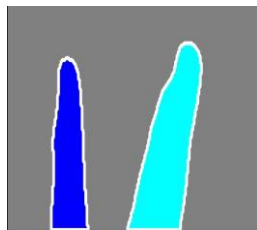


Figure 5: Boundary on Cropped Image

C. RECOGNITION ALGORITHM

Once total object boundaries are counted as feature, extracted features will be taken as inputs into proposed classification technique “Neural Network” which will perform reorganization and output should be total count of fingers.

Proposed & Implemented algorithm of Neural Network:

- Step1: Take features as Input Neuron
- Step2: Multiply Input Neuron with Weight
- Step3: Summation of Multiplied Neuron
- Step4: Pass summation value into activate function
- Step5: Display the output (As shown in Figure 6)



Figure 6: Output

IV. EXPERIMENT & RESULT

To evaluate proposed method 100 different images captured of hand gesture of counting number range from 0 to 5. Images collected by laptop camera. .Jpeg formatted images used for evaluation of proposed methodology. Proposed Image Processing techniques and Recognition algorithm implemented on Matlab version 2018. Average accuracy of the proposed system is 92%. Following table shows overall result of different images as correct finger count & incorrect finger count.

Hand Gesture Images Type	Total Testing Images	Total correct count	Total Incorrect count	Correct count Rate%
0	5	4	1	80%
1	20	20	0	100%
2	20	20	0	100%
3	20	20	0	100%
4	20	20	0	100%
5	15	11	4	73%
Total Gesture	100	95	5	

Table-1: Result Analysis

V. CONCLUSION

Counting fingers from hand gesture image is very useful application for dump people who can express their thoughts

by hand expression. Even though gesture can be captured by image or sensor, Image based identification is very popular today as it is cheap method. By simple cheap camera we can capture the image of hand gesture and can use as input for proposed method. Proposed method use various functions for processed the image, use image boundary method for feature extraction and use neural network for recognize from processed image. Methodology implemented and tested in MATLAB 2018. Average result of proposed system is 92%.

VI. FEATURE WORK

Proposed methodology is on progressing stage. There are many more features can be find from this type of processed images and one can use this for indentify numeric sign from mute person hand gesture image. Proposed techniques can be improved by different image processing methods and classification algorithms to recognize sign language which will very useful for deaf & dump people.

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