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Text Identification based on Hand Gesture Recognition using Neural Network

[1]Miss R. V. Joshi, [2]Dr. S. M. Deshmukh, [3]Prof.M.V.Tiwari

[1]Student Department-Electronics and Telecommunication Engineering PRMIT &R Badnera,
[2]Professor and Head PRMIT & R Badnera, [3]Professor PRMIT & R Badnera
[1] Department-Electronics and Telecommunication Engineering PRMIT &R Badnera,
[1] Department-Electronics and Telecommunication Engineering PRMIT &R Badnera, Maharashtra, India,

Abstract: The use of gestures as means to convey information is an important part of human communication. The hand gesture recognition are important methods for nonverbal communication for human beings. The non-verbal communication is not only used for physically challenged person but also it can be efficiently used for various applications such as 3D gaming, aviation, surveying, etc. To solve the difficulties faced by hearing impairment, it is necessary to develop a system which translates the sign language into text which can easily be recognized by the impaired people. A system is developed for hand gesture recognition in mat lab by using an artificial neural network.

Keywords: Gesture Recognition, Artificial Neural Network, Feature Extraction.

I. INTRODUCTION

Hand gestures are the movements of hands, arms or fingers. Gesture recognition is process of identifying gestures by the computer which is made by user. The idea of developing hand gesture recognition procedure is to develop, an interaction between human and computer and the recognized gestures are used to control the meaningful information [1]. The sign language recognition is done in two ways Static gesture and dynamic gesture [2] .Static hand gesture could only recognize the predefined gesture whereas dynamic hand gesture could clear the movement of gesture by its movement. For the past few years, the common input computer devices did not change a lot. This means, the communicating with computers at this moment are limited to mouse, keyboard, track ball, web-cam, light pen and etc. This is happened because the existing of input devices is adequate in order to perform most of the function that computer able to do. In other hand, the new application software is introduced into market. This software performed multiples of functions using just the common input computer devices. Vision based interfaces are feasible and popular at this moment because the computer is able to communicate with user using webcam.[3] This means, user able to give command to the computer by just showing some actions in front of the webcam without typing keyboard and clicking mouse button. Hence, users are able to perform human-machine interaction (HMI) with these user-friendlier features. Eventually, this will deploy new commands that are not possible with current computer input devices. Lately, there has been a surge in interest in recognizing human hand gestures. Hand gesture recognition has several of applications such as computer games, gaming machines, as mouse replacement and machinery control (e.g. crane, surgery machines). Moreover, controlling computers via hand gestures can make many applications work more intuitive than using mouse, keyboard or other input devices. The most structured sets of gestures belong to sign language [4]. In sign language, each gesture has an assigned meaning (or meanings). This project used some numeric sign like American Sign Language (ASL**)**. ASL is the language of choice for most deaf people. The main purpose of invented ASL is to allow deaf people communicate with normal people. ASL consists of approximately 6000 gestures of common words with finger spelling which are used to communicate proper nouns.

II. LITERATURE REVIEW

A real-time anti-encroaching hand gesture recognition and hand tracking mechanism has been proposed which will improve the human-computer interactions and bring ease for the ones who rely on gestures for their day-to- day communication. It can be a significant communication tool for deafened people [5]. A technique of hand gesture recognition on a video game based application has been proposed in [6]. Track hand gestures for better interaction with a video game. It is consisting of four hand gestures and four-hand direction classes to fulfill requirements that could have been extended to make it more powerful. It uses segmentation and tracking [7]. The proposed algorithm was performed on 40 samples and the accuracy turned out to be quite impressive. Use of a convolution neural network to reduce the feature extraction process and parameters being used has been discussed in [7]. The hand gesture recognition is performed using a convolution neural network but the one used in our paper shows a deep convolution neural network implementation. Results shown in [8] are very impressive when a training set of 50% of the database is used. Max Pooling Convolution Neural Network to advance Human- robot interactions using color segmentation, edge blurring with morphological digital image processing and then experimenting.

III. PROPOSED METHEDOLOGY

A generalized block diagram of recognition system is shown in fig 1

The presented system is based on one powerful hand feature in combination with a neural-network based classifier. In this paper, a new approach for the static hand gesture recognition is proposed.. The hand gesture area is separated from the background by using the well-known segmentation method of skin color that used in face recognition, then a contour of hand image is used as a feature that describe the hand shape. The image size is adjusted so that the width and height reaches a default value. As such, the general process of the proposed method is composed of three main parts:-

1. A preprocessing step to focus on the gesture.

2. A feature extraction step that use the hand contour of the gesture image, it is based on an algorithm proposed by Joshi, and Sivaswamy [9]. The hand contour will act as the feature of the gesture.

3. A classification step the unknown gesture's feature will be produced and entered to the neural network.

The gesture recognition process diagram is illustrated in figure 1, the hand region obtained after the preprocessing stage and it will be used as the primary input data for the feature extraction step of the gesture recognition.[10]

Now that a skin concentration map could be formed for any gesture trained, a method had to be found to compare a test gesture with each of them. Fundamentally, a trained and test gesture are a good match if all the areas of skin and background match up. However, a skin concentration map has no “skin” or “background” but rather a value between these two limits.

Therefore, in order to evaluate this recognition method a program was written to quantize the skin concentration maps so that all areas above a certain threshold were considered “skin”, all those below a second threshold considered “background” and all other pixels ignored. [11] A direct skin to skin and background to background comparison then became possible. The set of input is passed through the trained Neural Network which classifies the gesture into one of several predefined classes that can be identified by the system. [12]

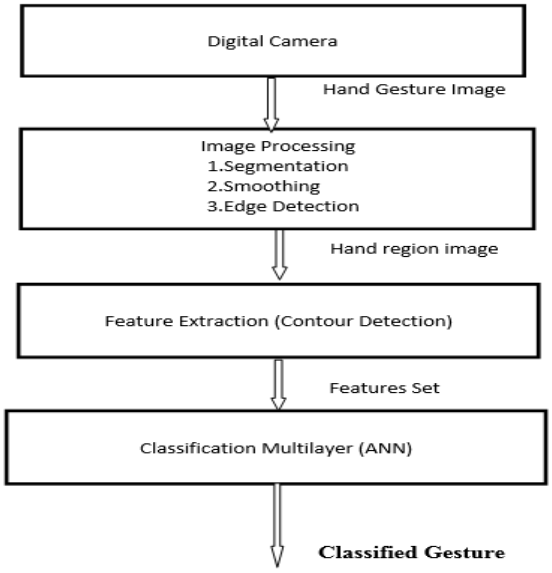

Figure1:-Block Diagram of recognition System

3.1 FEATURE EXTRACTION

Feature extraction can be defined as a process of transforming input data in set of features. In pattern recognition and image processing the input data is transformed into a reduced representation set of features [13]. Feature extraction involve reducing the number of resources required to describe a large set of data. The feature should carry the enough information about the image and should not require any domain-specific knowledge for their extraction.[14]

In order to make feature extraction more feasible for a large image collection and rapid retrieval the feature should be easy to compute. Also, they should relate well to the human perceptual characteristics since users finally determine the suitability of the images retrieved.

IV ARTIFICIAL NEURAL NETWORK

An Artificial neural network is usually a computational network based on biological neural network. Artificial neural networks have been developed as generalizations of mathematical models of human cognition or neural biology, based on the assumptions that [15].

1.Information processing is occurred at many simple places called neurons.

2. Signals are passed between neurons over connection links.

3. Each connection link has associated weight, which in a typical neural net, multiplies the signal transmitted.

Each neuron applies an activation function (usually nonlinear) to its net input (sum of weighted input signal) [16]. Figure 2 shows a simple artificial neuron.

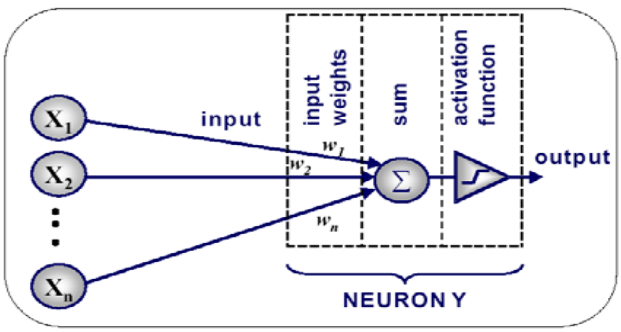

Figure 2:-A simple artificial neuron.

Today neural networks can be trained to solve problems that are difficult for conventional computers or human beings. The supervised training methods are commonly used, but other networks can be obtained from unsupervised training techniques or from direct design methods.

I. EXPECTED RESULT

The effectiveness of the proposed hand gesture algorithm neural network will used for classification of user's hand gestures. The classification will made without the need for using any special tools such as gloves or marker. However, the purpose algorithm performed well in classification user's hand gesture command, with some classification errors. The average classification rate of 80% to 90% will obtain for the testing sets**.** Processing. While detecting the images on live-videos or static image, the images and labels that were fed and trained in the model will be used to compare the output. Its palpable ability to determine the invariant problem of recognizing gestures despite all the noise and complications will undefeatable.

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