A Feature Point based Shape Analysis Approach for Indian Sign Recognition

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Abstract – Sign language is having its significance to perform the communication for deaf and mute community. Sometimes, these signs can be used to pass the communication in critical situations when voice communication is not possible. To understand such communication in automated way there is the requirement of human computer interaction for sign language. In this present work, a three stage model is presented is to perform the sign recognition. In first stage, the segmentation over the signs will be performed to separate the background and foreground. The next stage is to identify the feature points over the sign image. These feature points will be obtained using Harris corner approach. This feature point analysis approach will be applied on training set as well as input image. Once the featured input is generated, the recognition is carried out. The work will be implemented in MATLAB environment. The work is about to improve the recognition rate.

Index Terms – Feature Extraction, Harris Corner, Indian sign Language, Recognition, Sign Object.

1. INTRODUCTION

Sign Language is the only way of communication for deaf and dumb community. Every gesture has a meaning assigned to it. The difficulty is normal people could not understand these gestures. There arises a need for sign language interpreters who can interpret sign language to spoken language and vice versa [1]. It is difficult to find an interpreter at anywhere and anytime. There are two main directions in sign language recognition. One is using data gloves & other is visual approach. [4] With the advancement of science and technology many techniques have been developed not only to minimize the problem of deaf people but also to implement it in different fields[2].Sign Language recognition system transfers the communication from human-human to human-computer interaction[3]. HCI (Human Computer Interaction) system works not only in sign recognition but also in many important applications, especially at security sensitive locations like banks, park, airport etc. Hand sign recognition provides a better performance at distance and in low resolution also. Hand sign recognition is very difficult to perform rather than biometrics recognition because recognizing a fix image is very easy then recognizing an image present at distance. In this paper we presents a different image processing approach based on feature set to identify a sign gesture.

Fig(a) Human Computer Interaction[5]

2. LITERATURE SURVEY

In Year 2012, Yingying Zhu performed a work," The Role of Spatial Context in Activity Recognition". In this paper, Author propose a mathematical framework to model activities with both motion and context information for activity recognition. In Year 2010, Nikolaos Doulamis performed a work," Iterative Motion Estimation Constrained by Time and Shape for Detecting Persons' Falls". This paper presents the visual fall detection subsystem developing the framework of ISISEMD project. The system is able to detect person falls by taking into consideration only camera information. In Year 2012, Toshiaki Miyazaki performed a work," Estimation of the Number of Humans and their Movement Paths in a Room using Binary Infrared Sensors". In this paper, Author propose an algorithm that simultaneously estimates the number of humans and the movement path for each human in a room, using only the binary sensing data obtained from infrared sensors attached to the ceiling.In Year 2011, Medhat H. A. Awadalla performed a work," Spiking neural network-based control chart pattern recognition". In this paper, spiking neural network architecture is proposed to be used for control charts pattern recognition (CCPR). In Year 2001, Jie Yang performed a work," An Automatic Sign Recognition and Translation System". This paper discusses problems of automatic sign recognition and translation. Author presents a system capable of capturing images, detecting and recognizing signs, and translating them into a target language. In Year 2011, Eunju Kim performed a work," Assurance-Oriented Activity Recognition". In this work

Author propose an extension of an existing AR approach in which richer recognition semantics that address confidence and assurance are provided. In Year 2008, Derek Hao Hu performed a work," Real World Activity Recognition with Multiple Goals".In Year 2011, Nguyen Dang Binh performed a work," Long Term Carefully Learning for Person Detection Application to Intelligent Surveillance System".

3. PROPOSED METHODOLOGY

In this present work, the Indian sign recognition approach is defined. The key aspect in this work is to identify the effective feature points over the sign so that the effective representation of feature points will be done. The work is here defined as three stage model. In first stage of work, the preprocessing is performed. During this stage, color model analysis will be defined to separate the foreground and background areas. Once the object area will be identified, the Harris corner approach will be defined to identify the feature point over the sign. This feature extraction will be performed on complete dataset and feature set will be obtained. Finally sign will be identified. The work is about to improve the recognition ratio.

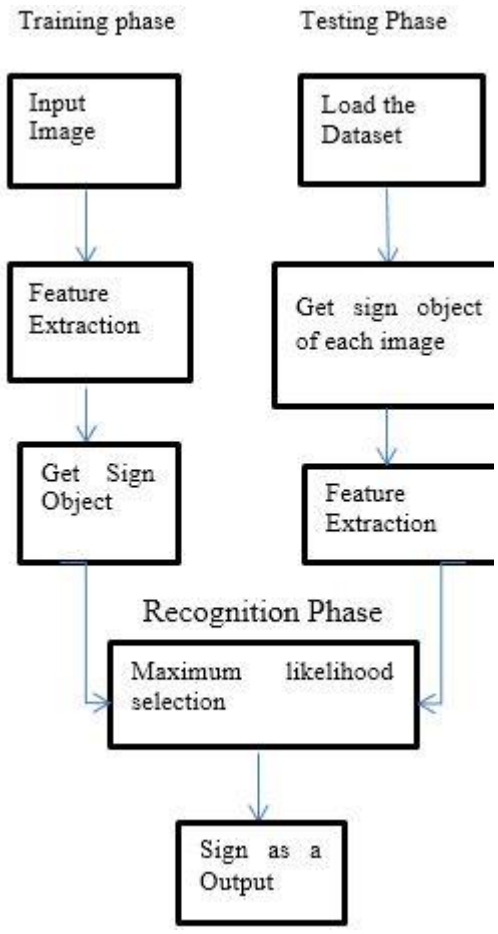

Fig (b) Block Diagram

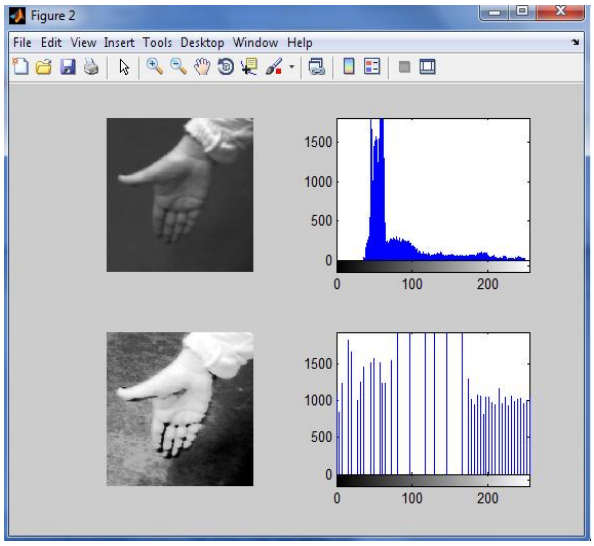

Fig (c) Histogram Equalization

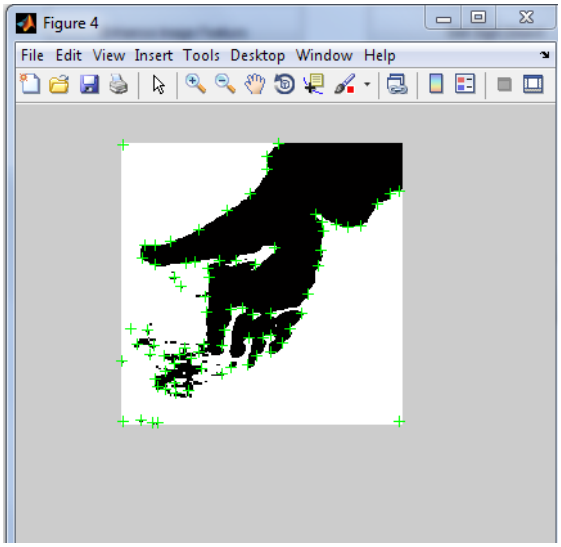

Fig (d) Detect Feature points

3.1. Algorithm

Classification (SignSet,SignImage)

/*SignSet is the Hand Sign Dataset with adpative class specification, Sign Image is the input image for which the class recognition is applied*/
{
SignImage=Normalize (SignImage)
[Normalize the size of image and transformation to grayscale form]
SignImage=Equalize (SignImage)
[Improve the Sign image Features using Histogram Equalization]
FeatureImg=ExtractFeatures(SignImage)

```
        [Apply the Harris Corner Model to obtain the image features]
For i to SignSet.length
        [Process All the Dataset Image]
          {
img=GetImage(SignSet,i)
          [Extract the Dataset Image]
img=Equalize(img)
        [Enhance the Image Features]
FeatureSet(i)=ExtractFeature(img)
        [Generate the Featureset over the SignSet]
         }
.        ClassSet=SetClasses( FeatureSet, Classes)
          [Define the Classes for known Signset images]
trainset=Train(FeatureSet, ClassSet)
        [Train the Feature set under class specification so that the feature analysis will be done]
class=Test(trainset, FeatureImg)
        [Test the Input Feature on trainset for class identification]
distance=Map(trainset, featureImg)
        [Apply the distance Analysis over the featureset and the feature Image]
index=MinDist(distance)
    [Idenitfy the maximum mapped image from the image defined by index position index]
class=GetClass(index)
        [Identify the class of mapped image]
        Return class;
}
```

4. RESULTS AND DISCUSSIONS

For proving the accuracy of proposed work, number of experiments were carried out on number of images. Algorithm is applied on gray scale image. And accuracy can be calculated by following method

$$\text{Accuracy} = \frac{\text{Correctly recognised gesture}}{\text{Total No. of gesture}} * 100$$

As the experiment done on different 110 different Indian sign gesture of 13 different people and success rate of our approach reaches upto 98. Table 1 represent the accuracy rate for sign recognition system based on other method.

Sr No.	Key point of approach	Accuracy Rate
1	Structural Shape descriptor	80.98%
2	Invariant Moments	40.36%
3	Multiclass Support Vector Machine	96.23%
4	Proposed	98% Approx.

Table 1 Accuracy Rate

5. CONCLUSION

In this paper, a feature point based approach is introduced which works on real time basis. The feature point based shape analysis approach uses the feature points that have been found with the help of Harris corner algorithm. These points are invariant to background, lightening etc. The Harris corner will identify the specific deviation point so that the symbol shape can be identified along with area limits. The use of this approach increases the recognition rate and also uses less memory for storage.

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