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## Study and Improve the Recognition Accuracy of Indian Sign Language Number Gesture Approach

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**ABSTRACT:** Image classification is one of classical issue of concern in image processing. There are various techniques for solving this issue. Sign languages are natural language that used to communicate with deaf and mute people. There is much different sign language in the world. But the main focused of system is on Indian Sign Language (ISL) which is on the way of standardization in that the system will concentrated on hand gestures only. Hand gesture is very important part of the body for exchange ideas, messages, thoughts among deaf and dumb people. The proposed system will recognizes the number 0 to 9 from Indian Sign Language. It will divide into three parts i.e. preprocessing, feature extraction, classification. It will initially identify the gestures from Indian Sign language. Finally, the system processes that gesture to recognize number with the help of classification.

**KEYWORDS:** Hybrid Approach, Indian Sign Language, Number Gesture Recognition.

### I. INTRODUCTION

Sign Language is a best way of communication between deaf, dumb people and normal people. A sign language is visual language that uses system of manual, facial and body movements. Sign language is not universal language and different sign languages are used in different countries, some countries like UK, USA and India having more than one Sign Language. Hundreds of Sign Languages are using in World, American Sign Language, Indian Sign Language, Japanese Sign Language, Turkish Sign Language these are the some examples of Sign Language. Indian Sign Language is the part of Sign Language which is mostly used by deaf and dumb people in India, Signs are depends upon the regional language so in India there is no one standard Sign Language. Indian Sign Language is on the way of standardization, this task given to Ramakrishna Mission Coimbatore by Indian Government. Artificial Neural Network (ANN), a brain-style computational model, has been used for many applications. Researchers have developed various ANN's structure in accordant with their problem. After the network is trained, it can be used for image classification. The Support Vector Machine is a theoretically superior machine learning methodology with great results in classification of high dimensional datasets and has been found competitive with the best machine learning algorithms. In the past, SVMs have been tested and evaluated only as pixel-based image classifiers. Moving from pixel-based techniques towards object-based representation, the dimensions of remote sensing imagery feature space increases significantly. This results increasing complexity of the classification process, and causes problems to traditional sample-based classification schemes. In this study, we have developed a novel approach of recognizing hand number gestures by recognizing or labeling hand parts in depth images. Our proposed approach consists of two main processes: hand parts recognition by random forests (RFs) classifier and rule based hand number gestures recognition. The main advantage of our proposed approach is that the state of each finger is directly identified through the recognize hand parts and then number gestures are recognized based on the state of each finger.

### II. REVIEW OF LITERATURE

**1. Paper Name-** Dong-Luong Dinh , Sung young Lee , Tae Seong K , "Hand Number Gesture Recognition Using the Recognized Hand Parts in Depth Images", Springer Science Business Media New York 2014.



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**Proposed Work-** This paper include the feature extraction, gesture recognition process for thatthey have proposed a novel approach for recognizing hand number gesturesusing the recognized hand parts in a depth image. In this paper they proposed a system in that approach they divided that approach into two stages

(i) Hand parts recognition by random forests (RFs) and (ii) rule-based handnumber gestures recognition. This contains pairs of depth maps and their Corresponding hand parts labeled maps was generated after that they used DB to training RFs. In the second stage, a depth image was first capturedfrom a depth camera and then a hand depth silhouette was extracted byremoving the background. Next, the hand parts of a depth silhouette wererecognized using the trained RFs. Next, a set of features was extracted fromthe labeled on the extracted features, labeled hand parts finally they used rule-based approach to recognize number gesture (2014).

**2. Paper Name-** Dr. Dharaskar Rajiv, Dr. Mr.Futane Pravin, “Hand Gesture Recognition System for numbers uses Thresholding”,2011.

**Proposed Work-** This paper include the techniques like thresholding,feature extraction,on thehelp of this feature they proposed a simple method for recognition of numbers. They used thresholding value for recognition of numbers. They dividethat method into three stages i.e. first they captured image by using webcamera after capturing image they applied threshold value on that and using that threshold value they recognized the numbers(2011).

**3. Paper Name-**Aanksha Singh, Saloni Aora Indian Sign Language Gesture Classification as Single or Double Handed Gesture Third International Conference on ImageIntonation Processing, 2015.

**Proposed Work-** This paper contain the features like image-preprocessing,HOG, feature extraction,gesture recognition on the basis of that they have propose a systemfor decomposition of gestures into single handed or double handed gesture.

They classifying gesture into these subcategories simplify the process of gesture recognition in the ISL due to presence of lesser number of gestures ineach sub category. They used Histogram of Gradients (HOG) features andgeometric descriptors using KNN and SVM classifiers were tried on a datasetconsisting of images of 26 English alphabets present in the ISL under variable background. The HOG features when classified with Support VectorMachine were found to be the most efficient approach result of this systemin term of accuracy is 94.23.

**4. Paper Name-**Anup Kumar, Mevin M. Domini, Sign Language Recognition 3rd In CI Confon Recent Advances in Information Technology I RAIT-2016.

**Proposed Work-** In this proposed system they have made application for those who thosevocal and hearing disabilities. It discusses an improved method for sign language recognition and conversion of speech to signs. The algorithm devised iscapable of extracting signs from video sequences under minimally clutteredand dynamic background using skin color segmentation. It distinguishesbetween static and dynamic gestures and extracts the appropriate feature vector. These are classified using Support Vector Machines. Speech recognition is built upon standard module Sphinx. Experimental results showsatisfactory segmentation of signs under diverse backgrounds and relativelyhigh accuracy in gesture and speech recognition (2016).

**5. Paper Name-**Wu CH, Lin CH (2013),“Depth-based hand gesture recognition for home appliance control”. In: Proceedings of IEEE 17th international symposium on consumer electronics, pp 279–280

**Proposed Work-**This paper presented a dynamic hand gesture recognition system for home appliance control using only the depth camera. The dynamic hand gesture is recognized using static hand postures and hand trajectory. The proposed system can recognize seven commonly used dynamic hand gestures. Experimental results show that the system is effective for home appliance control.

**6. Paper Name-**Liu X, Fujimura K (2004).“Hand gesture recognition using depth data”. In: Proceedings of IEEEinternational conference on automatic face and gesture recognition, pp 529–534



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**Proposed Work**-This paper introduces a novel hand gesture recognition scheme based on depth data. The hand is firstly extracted from the acquired depth maps with the aid also of color information from the associated views. Then the hand is segmented into palm and finger regions. Next, two different set of feature descriptors are extracted, one based on the distances of the fingertips from the hand center and the other on the curvature of the hand contour. Finally, a multiclass SVM classifier is employed to recognize the performed gestures.

**7. Paper Name**-Priyal SP, Bora PK (2010).“A study on static hand gesture recognition using moments”. In: Proceedings of international conference on signal processing and communications (SPCOM), pp 1–5

**Proposed Work**-In this context, the geometric moments and the orthogonal moments namely the Zernike, Tehebichef and Krawtchouk moments are explored. The proposed system detects the hand region through skin color identification and obtains the binary silhouette. These images are normalized for rotation and scale changes. The moment features of the normalized hand gestures are classified using a minimum distance classifier.

**8. Paper Name**-Ren Z, Yuan J, Meng J, Zhang Z (2013).“Robust part-based hand gesture recognition using Kinect sensor”.IEEE Trans. Trans Multimedia 15(5):1110–1120

**Proposed Work**-This paper focuses on building a robust part-based hand gesture recognition system using Kinect sensor. To handle the noisy hand shapes obtained from the Kinect sensor, we propose a novel distance metric, Finger-Earth Mover’s Distance (FEMD), to measure the dissimilarity between hand shapes. As it only matches the finger parts while not the whole hand, it can better distinguish the hand gestures of slight differences.

### III. SYSTEM OVERVIEW/SYSTEM ARCHITECTURE

The Proposed work is to focus on the hybrid approach of algorithms for classification of numbers. Proposed model consist of four phases i.e.Preprocessing,FeatureExtraction, Classification,Recognition.After done with recognition system will translate recognize number into mobile using translator.In the proposed model the hybrid method of ANN-SVM algorithm is going to use, ANN for classification of feature extraction and SVM for classification of numbers.After that the translator will translate that particular number into specific mobile number.The first section of the proposed model is consisting of Image acquisition andPreprocessing of the image. The very first step is capture image through a camera or through video.After getting image resize that image and extract hand part from that image. Remove the noise if present and converted into Binary Image.The second section is consist of Feature Extraction, There are many features available for gesture recognition but this system will concentrating on figure tip and active-inactive fingers.After getting features it will give it to ANN, ANN classified the features and gives it to SVM. SVM again classified that features for the higher accuracy and compare with training dataset and gives the output.

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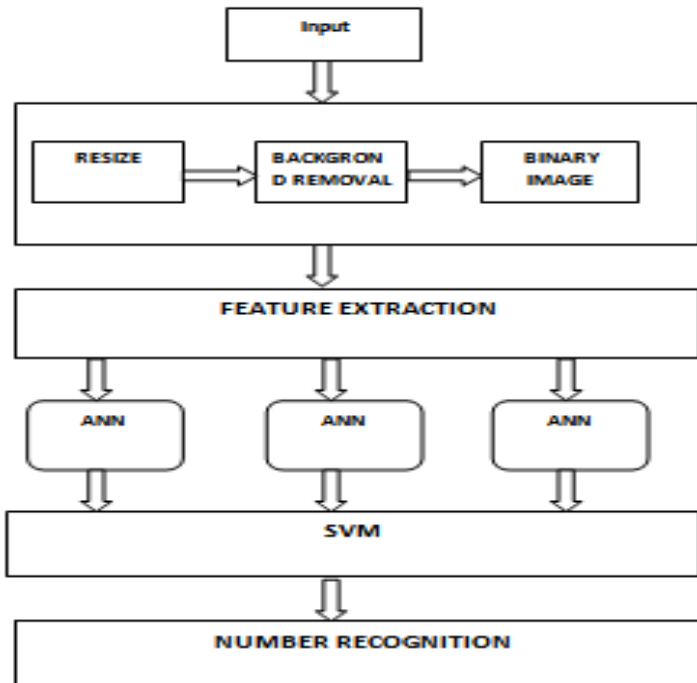


Figure1. Proposed System Architecture

## IV.SYSTEM ANALYSIS

| fThumb | fIndex | fMiddle | fRing | fPinkie | Rep. No |
|--------|--------|---------|-------|---------|---------|
| 0      | 0      | 0       | 0     | 0       | 0       |
| 0      | 1      | 0       | 0     | 0       | 1       |
| 0      | 1      | 1       | 0     | 0       | 2       |
| 0      | 1      | 1       | 1     | 0       | 3       |
| 0      | 1      | 1       | 1     | 1       | 4       |
| 1      | 0      | 0       | 0     | 0       | 5       |
| 1      | 1      | 0       | 0     | 0       | 6       |
| 1      | 1      | 1       | 0     | 0       | 7       |
| 1      | 1      | 1       | 1     | 0       | 8       |
| 1      | 1      | 1       | 1     | 1       | 9       |

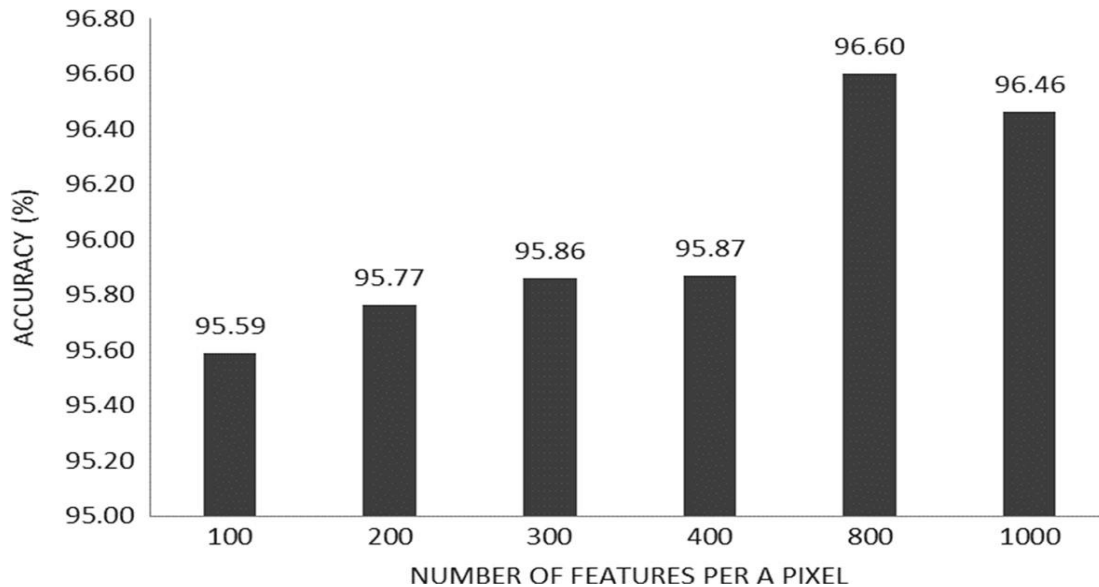
Table- Recognition rules of the number gestures based on the states of the five fingers

In this part, we have first optimized some main parameters on our own hand synthetic DB and then evaluated hand parts recognition through quantitative and qualitative assessments using synthetic and real data. Final, we have tested to evaluate our proposed hand number gesture recognition methodology on real data.

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**Figure.2. Effects of pixel features on recognition accuracy**

As can be seen in Fig. 2, the feature numbers extracted for each pixel in RFs obtained maximum recognition accuracy at around 800.

## V. CONCLUSION

Hand gesture recognition for real-life applications is very challenging because of its requirements on the robustness, accuracy and efficiency. In this work good comparative study has been adopted based on the methodology proposed using hybrid approach this will help to improving recognition accuracy of number gesture and also it will be tested for translation of recognize number to mobile number. ANN\_SVM is the integrating model of two kinds of soft computing technique in image classification. It is a two layers classifier. The first layer contains k ANN(s), and this layer give the classifying result based on one by one image's feature vector. The second layer contains a SVM classifier, and its purpose is to integrate all results of the first layer.

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