Research Article Impact Factor: 0.621 ISSN: 2319-507X
Neha Tavari, IJPRET, 2014; Volume 2 (8): 39-47 IJPRET

INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

REAL TIME VISUAL RECOGNITION OF INDIAN SIGN LANGUAGE

NEHA V. TAVARI[1], PROF. ANIL V. DEORANKAR[2], DR. PRASHANT N. CHATUR[3]

1. M. Tech. Scholar, Department of Computer Science and Engineering, Government College of Engineering, Amravati, Maharashtra, India.
2. Associate Professor, Department of Computer Science and Engineering, Government College of Engineering, Amravati, Maharashtra, India.
3. Head of Department, Department of Computer Science and Engineering, Government College of Engineering, Amravati Maharashtra, India.

Accepted Date: 15/02/2014 ; Published Date: 01/04/2014

Abstract: Communication is the means of exchanging information, views and expressions among different persons, in both verbal and non-verbal manner. Hand gestures are the non verbal method of communication used along with verbal communication. A more organized form of hand gesture communication is known as sign language in which each alphabet of the english vocabulary is assigned a sign which is used by deaf and the dumb to communicate with each other. In this paper a novel approach for recognizing various alphabets of Indian Sign Language is proposed where continuous video sequences of the signs have been considered so that the less fortunate people may communicate with the outside world without the need of an interpreter. Thus presenting a system that recognizes Indian sign language(ISL) based on hand gestures allows the user to interact with the system in natural way. As most of the ISL gestures are produced using both hands, implementing ISL recognition is a challenging approach in the field of gesture recognition.

Keywords: Indian sign language, Deaf and dumb, Human computer interaction, Hand gesture, Computer vision.

Corresponding Author: Ms. NEHA TAVARI

Access Online On:

www.ijpret.com

How to Cite This Article:

Neha Tavari, IJPRET, 2014; Volume 2 (8): 39-47

PAPER-QR CODE

INTRODUCTION

Sign language is widely used by physically impaired people who cannot speak and hear or who can hear but cannot speak and is the only medium of communication for those people. It is nothing but the combination of various gestures formed by different hand shapes, movements and orientations of hands or body, facial expressions and lip-patterns for conveying messages. These gestures are widely used by the deaf and dumb people to express their thoughts[1]. A Sign Language is a language in which people use to communicate by visually transmitting the sign patterns to express the meaning. It is a replacement of speech for hearing and speech impaired people. Thus, because of which it has attracted many researchers in this field from long[2].

As sign language is well structured code gesture, each gesture has a meaning assigned to it [3]. There are number of sign languages spreaded across the world. The sign language used by those deaf and mute at a particular place is dependent on the culture and spoken language at that place. American Sign. Language (ASL), British Sign Language (BSL), Japanese Sign Language family (Japanese, Taiwanese and Korean Sign Languages), French Sign Language family (French, Italian, Irish, Russian and Dutch Sign Languages), Australian Sign Language, etc.[4] are the examples of regionally different sign languages. Indian sign language (ISL) is used by the deaf and dumb community in India. Designing a hand gesture recognition system for ISL is more challenging than other sign languages due to the following reasons.

- Unlike other sign languages (American Sign Language, German Sign language) Indian Sign Language uses both hands to make sign.
- Some signs involve overlapping of both the hands and complicated hand shapes.
- One hand moves faster than the other at times in dynamic hand gestures.

Since ISL got standardized only recently and also since tutorials on ISL gestures were not available until recently, there are very few research work that has happened in ISL recognition[5]. The hearing impaired people becomes neglected from the society because the normal people never try to learn ISL nor try to interact with the hearing impaired people. This becomes a curse for them and so they mostly remain uneducated and isolated. Thus recognition of sign language was introduced which has not only been important from engineering point of view but also for the impact on society. Our paper aims to bridge the gap between us and the hearing impaired people by introducing an inexpensive Sign Language Recognition technique which will allow the user to understand the meaning of the sign without

the help of any expert translator. Computers are used in communication path which helps in capturing of the signs, processing it and finally recognizing the sign[2].

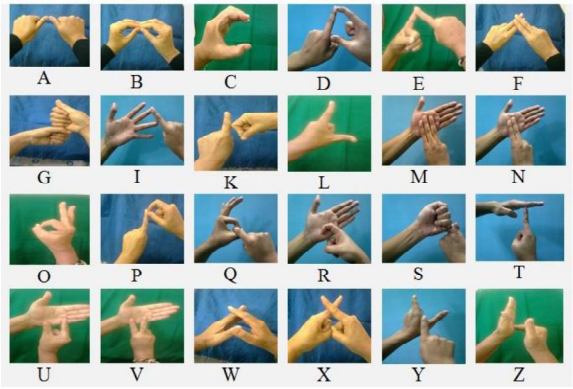

Fig 1: Various alphabets of Indian Sign Language [2]

A. Background

The use of the hand as an input device is a method that provides natural human-computer interaction. Among the challenges of human-computer interaction is the creation of user-friendly interfaces that use natural communication. Sophisticated applications such as virtual environments or augmented-reality systems should problem effective human-computer interaction for applications involving complex tasks. The users should be supplied with sophisticated interfaces in such applications allowing them to navigate within the system, select objects, and manipulate them.

The use of computer vision for human-computer interaction is a natural, non-intrusive, non-contact solution. Computer vision can be used for gesture detection and classification, and various approaches have been proposed to support simple applications. To recognize hand gestures using computer vision, it is first needed to detect the hand on an image or video stream. Hand detection involve extraction of position and orientation on the hand, fingertip locations, and finger orientation from the images. The common method for locating the hand is Skin-color filtering because of its fast implementation. Skin-color filters rely on the assumption that the hand is the only skin-colored object. Gesture classification is a research field involving many machine-learning techniques such as neural networks and hidden Markov models[6].

B. Related work

Dhruva N. and Sudhir Rao Rupanagudi, Sachin S.K., Sthuthi B., Pavithra R. and Raghavendra [7]developed a novel segmentation algorithm to meet this requirement in which the woolen hand gloves were modified by replacing and sewing each finger of the glove with a colored cloth for each digit of the hand. Recognition based on 'UP' and 'DOWN' positions of fingers[3] was proposed by a Rajam, P. Subha and Dr G Balakrishnan. Deepika Tewari, Sanjay Kumar Srivastava proposed an algorithm for hand gesture recognition system in ISL which is based on vision-based approach. DCT-based feature vectors are classified to check whether sign mentioned in the input image is "present" or "not present" in the ISL database using self-organizing map (SOM)[4] with unsupervised learning technique in Artificial Neural Network (ANN).

Transition movement models (TMMs) [8] is proposed by Gaolin Fang, Wen Gao, and Debin Zhao to handle transition parts between two adjacent signs in large-vocabulary continuous SLR. An approach is made to recognize alphabet characters dynamically from color image sequences using "Continuous Adaptive Mean Shift Algorithm (CAMSHIFT)" tracking algorithm stated in[10] by Sulochana M. Nadgeri, Dr. S. D. Sawarkar, Mr. A. D. Gawande[9]. The algorithm used here is based on a robust nonparametric technique for climbing density gradients to find the mode(peak) of probability distributions called the mean shift algorithm. Data from five-channel surface electromyogram and 3-D accelerometer from the signer's dominant hand were analyzed by Vasiliki E. Kosmidou, and Leontios J. Hadjileontiadis[10] using intrinsic mode entropy (IMEn) for the automated recognition of Greek sign language (GSL) isolated signs.

SIGN LANGUAGE RECOGNITION SYSTEM

The sign language recognition done using cameras may be regarded as vision based analysis system. The proposed work is aimed to develop a model based on pattern recognition techniques using neural net training and back propagation algorithm.This model works as sign language education and recognition platform for hearing impaired peoples and communication system for dumb people to convey their message.The idea may be implemented using a simple web camera and a computer system.It is represented with following block diagram in fig 2.

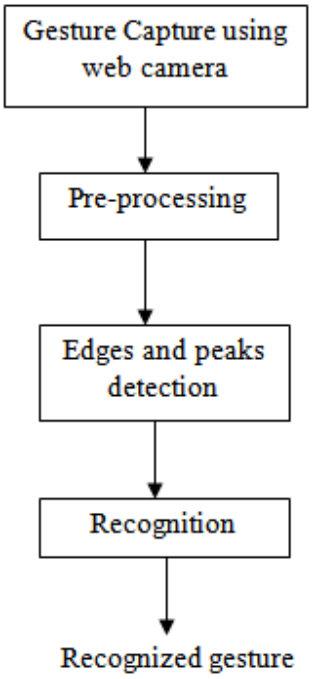

Fig 2. System block diagram

Gesture capture using web camera

The first step towards image processing is to acquire the image. The acquired image that is stored in the system windows needs to be connected to the software automatically. This is done by creating an object.With the help of high speed processors available in computers today, it is possible to trigger the camera and capture the images in real time. The image is stored in the buffer of the object.As has been already discussed, the image is acquired using a simple web camera. Image acquisition devices typically support multiple video formats. When we create a video input object, we can specify the video format that you want the device to use. If the video format as an argument is not specified, the video input function uses the default format. Use the imaqhwinfo function to determine which video formats a particular device supports and find out which format is the default[11].

Image capturing is a random process. The resolution of various image capturing devices may not be the same. This results in different resolution of the captured images. For accurate comparison of the features and to reduce the computational effort needed for processing, all the images should be scaled to a uniform size[1].

Fig 3. Acquired image, gesture 'B'

Preprocessing

The image scene and information should not be altered by local changes due to noise and digitization error. Hence to satisfy the environmental scene conditions, preprocessing of the raw data is highly important. The objective of gesture segmentation is to extract the gesture region from the background of the image. . Image preprocessing includes the set of operations on images whose goal is the improvement of the image data that suppresses undesired distortions or enhances some image features important for further processing. The captured image is a RGB image. This image is first converted into grayscale as some of the preprocessing operations can be applied on grayscale image only.

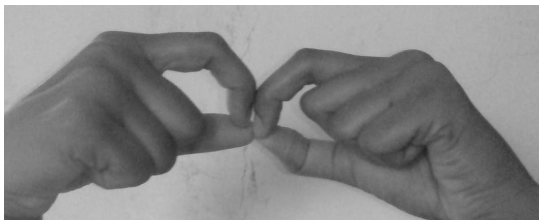

Fig. 4 Gray Scale Image, gesture'B'

Edges & peaks detection

The edges are detected in the binary image. A number of edge detection techniques may be used in matlab. Several types of features have been suggested by the researchers for real time gesture recognition[12].The purpose of edge detection in general is to significantly reduce the amount of data in an image, while preserving the structural properties to be used for further image processing.[11]

Many interesting points on every object can be extracted to provide a "feature" description of the object. Features vector of the segmented image can be extracted in different ways according to particular application. Under different scene conditions, the performance of different feature detectors will be significantly different. The nature of the background,

existence of other objects (occlusion), and illumination must be considered to determine what kind of features can be efficiently and reliably detected. Usually the hand shape and the movement are of major concern in order to recognize gesture.In this method, we consider two Point of Interest(POI) shown in fig.5 in order to represent the 'shape' and 'direction of movement'.

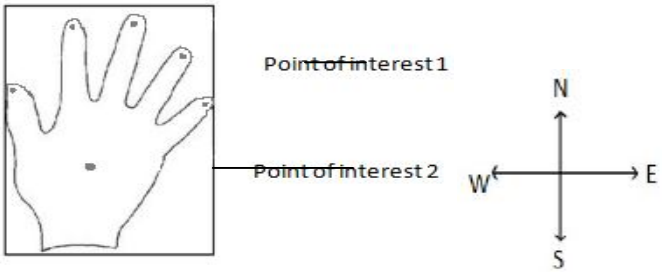

Fig 5. Point of Interest 1 and 2

Recognition

All the above step has to be followed for every training and testing gestures. For testing pattern based on the feature vector obtained we used neural network classifier. feature vector obtained from the feature extraction step is used as the input of the classifier that recognizes the sign[1]. Training and generalizing are the most basic and important properties of the neural networks. Hence ,Artificial neural network is used as the classification tool. Different network models exist for training the neural net and depending on the feature vectors, the best neural net training method is chosen. An artificial neural network processes information by creating connections between artificial neurons and they are widely used to model complex relationship between inputs and outputs. Training or learning is used to configure a neural network such that the application of a set of inputs produces a set of desired outputs.Many different algorithms exist to train an artificial neural network.

Backpropagation algorithm is the most commonly used algorithm for training a feedforward neural network. The term "backpropagation" describes how this type of neural network is trained. When using a supervised training method, the network must be provided with both sample inputs and anticipated outputs. The anticipated outputs are compared against the actual outputs for given input. Using the anticipated outputs, the backpropagation training algorithm then takes a calculated error and adjusts the weights of the various layers backwards from the output layer to the input layer. Thus, using this algorithm it is possible to recognize each gesture more correctly.

CONCLUSIONS

The Primary focus of this system is to examine image processing as a tool for the conversion of Indian Sign Language (ISL) gesture in to digital text. The system will be able to recognize 26 hand gestures which represents the alphabets from A to Z based on vision based technique. As the method implements completely by using digital image processing technique so the user does not have to wear any special hardware device to get features of hand shape.Also, it should be noted that the proposed gesture recognizer cannot be considered as a complete sign language recognizer, because for complete recognition of sign language, information about other body parts i.e., head, arm, facial expression is necessary.In improved light conditions and controlled environment, we can develop a real time sign language recognition system. In future, there can be many possible improvements that will broaden the scope of this work.

REFERENCES

1. Adithya V., Vinod P. R., Usha Gopalakrishnan , "Artificial Neural Network Based Method for Indian Sign Language Recognition" , *IEEE Conference on Information and Communication Technologies (ICT)* ,2013, pp. 1080-1085.

2. Joyeeta Singha,Karen Das, **"**Recognition of Indian Sign Language in Live Video**"**, *International Journal of Computer Applications,*Vol.19, May 2013,pp.17-22.

3. Rajam, P. Subha and Dr G Balakrishnan , "Real Time Indian Sign Language Recognition System to aid Deaf and Dumb people", *13th International Conference on Communication Technology(ICCT)* ,2011, pp 737-742.

4. Deepika Tewari, Sanjay Kumar Srivastava , "A Visual Recognition of Static Hand Gestures in Indian Sign Language based on Kohonen Self- Organizing Map Algorithm", *International Journal of Engineering and Advanced Technology (IJEAT),* Vol.2, Issue 2, Dec 2012, pp. 165-170.

5. Geetha M, Manjusha U C , "A Vision Based Recognition of Indian Sign Language Alphabets and Numerals Using B-Spline Approximation", *International Journal on Computer Science and Engineering (IJCSE),* Vol. 4 ,No. 03,March 2012, pp. 406-415.

6. David J. Rios-Soria, Satu E. Schaeffer, Sara E. Garza-Villarreal,"Hand-gesture recognition using computer-vision techniques".

7. Dhruva N. and Sudhir Rao Rupanagudi, Sachin S.K., Sthuthi B., Pavithra R. and Raghavendra , "Novel Segmentation Algorithm for Hand Gesture Recognition", *IEEE*,,2013, pp. 383-388.

8. Gaolin Fang, Wen Gao, and Debin Zhao, "Large-Vocabulary Continuous Sign Language Recognition Based on Transition-Movement Models", *IEEE transactions on systems, man, and cybernetics—part a: systems and humans,* Vol. 37, No. 1, Jan 2007.

9. Sulochana M. Nadgeri,Dr. S.D.Sawarkar,Mr.A.D.Gawande, "Hand gesture recognition using CAMSHIFT Algorithm",*Third International Conference on Emerging Trends in Engineering and Technology, IEEE* ,2010, pp.37-41.

10. Vasiliki E. Kosmidou, and Leontios J. Hadjileontiadis, "Sign Language Recognition Using Intrinsic-Mode Sample Entropy on sEMG and Accelerometer Data", *IEEE transactions on biomedical engineering,* Vol. 56, No. 12, Dec 2009.

11. Er. Aditi Kalsh, Dr. N.S. Garewal, "Sign Language Recognition System", International Journal of Computational Engineering Research,Vol, 03,Issue 6,June 2013, pp. 15-21.

12. Anup Nandy, Jay Shankar Prasad, Soumik Mondal, Pavan Chakraborty, and G.C. Nandi, "Recognition of Isolated Indian Sign Language Gesture in Real Time", *Springer-Verlag Berlin Heidelberg* ,2010, pp. 102–107.