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Real Time Hand Gesture Recognition using Different Algorithms based on Indian Sign Language

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***Abstract*: Sign Language research field is based on human interaction with computers. The system works on the different data samples of signs to make it more accurate with the help of an Artificial Neural Network (ANN). Today, a lot of research is being gone on the field of sign language recognition. The main purpose of this system is to represent a real-time HGR system based on Indian Sign Language (ISL) recognition with higher accuracy. Indian Sign Language (ISL) used by Deaf peoples community in India, does have acceptable, meaningful essential and structural properties.**

***Keywords*: Artificial Neural Network, Indian Sign Language, Hand Gesture Recognition, Deaf community**

1. Introduction

India has so many languages. Such a vast diversity in languages has its challenges when it comes to communicating over different villages, societies, and states. Indian Sign Language (ISL) is used by the Deaf community peoples. This system acquires gesture images of ISL with black background from mobile video camera for feature extraction. There are analyzing phase, pre-processing unit the noise removal, greyscale conversion, binarization of images followed by feature extraction. In future extraction five steps followed in which fingertips are searched by eccentricity. Next are elongations of images, measured by considering pixel segmentation as well as rotation of images. In feature extraction, the algorithmic study used to find the feature vectors of systematic results combines K curvature and convex hull algorithms. In present work "K convex hull" algorithm which is used to detect fingertip with greater accuracy. In our system, the Artificial Neural Network (ANN) is used for future recognition in which we having the input unit of training data set of images. Next, we have a hidden unit which acts upon this training dataset to evaluate the output unit results data set. This entire ANN works by considering the factors namely textures of images, colors, shapes, spatial rotations.

In present work Sign language is the primary language of those people who are deaf or hard of hearing and also used by those who can hear but cannot physically speak. It is a complex but complete language which involves the movement of hands, facial expressions, and postures of the body. Sign language is not universal. Every country has its own native sign language. Each sign language has its own rules of grammar, word orders and pronunciation. The problem arises when deaf and dumb people try to communicate using this language with the people who are unaware of this language grammar. So it becomes necessary to develop an automatic and interactive interpreter to understand them. People want something more natural. Another one is based on computer vision-based gesture recognition, which involves image processing techniques. Consequently, this category faces more complexity.

2. Literature survey

Sharmila Konwar et al, [1] states that this System is aimed to design an automatic vision-based American Sign Language detection system and converting results into text. The work introduced in this paper is meant to outline a programmed vision based American Sign Language recognition framework and interpretation to content. To distinguish the human skin shading from the picture, the HSV shading model is utilized. At that point, edge recognition is connected to distinguish the hand shape from the picture. An arrangement of morphological activity is connected to get a refined yield for the gesture-based communication acknowledgment. This work is mainly focussed on the color model and edge detection phenomenon. Using Edge detection algorithm, the hand gestures are detected successfully for the alphabets in the American language. Some images are not detected successfully due to geometric variations, odd background, and light conditions.

Yo-Jen Tu et al, [2] presented a face and signal acknowledgment based human-PC communication (HCI) framework utilizing a solitary camcorder. Not the same as the traditional specialized strategies among clients and machines, they consolidate head posture and hand motion to control the hardware. The position of the eyes and mouth are utilized for the facial focus to assess the posture of the head. Two new techniques are displayed in this paper: programmed signal territory division and introduction to the standardization of the hand signal. It isn't compulsory for the client to keep signals in

an upright position, the framework fragments and standardizes the signals consequently. The explore demonstrates this technique is extremely precise with motion acknowledgment rate of 93.6%. The client can control different gadgets, counting robots all the while through a remote system.

Angur M. Jarman et al, [3] exhibited another calculation to distinguish Bengali Sign Language (BSL) for perceiving 46 hand signals, including 9 motions for 11 vowels, 28 motions for 39 consonants and 9 motions for 9 numerals as indicated by the similitude of elocution. The picture was first re-sized and after that changed over to double configuration to edit the locale of enthusiasm by utilizing just best most, left-most and right-most white pixels. The places of the fingertips were found by applying a fingertip discoverer calculation. Eleven highlights were extracted from each picture to prepare a multilayered feed-forward neural system with a back-spread preparing calculation. The separation between the centroid of the hand area and each fingertip was ascertained alongside the points between every fingertip and flat x pivot that crossed the centroid. A database of 2300 pictures of Bengali signs was developed to assess the viability of the proposed framework, where 70%, 15% and 15% pictures were utilized for preparing, testing, and approving, separately. The exploratory outcome demonstrated a normal of 88.69% exactness in perceiving BSL which is particularly encouraging contrast with other existing techniques.

Javeria Farooq et al,[4] found that the hand motion acknowledgment is a characteristic and natural way to connect with the PC since cooperation's with the PC can be expanded through multidimensional utilization of hand motions as a contrast with other information techniques. The reason for this paper is to investigate three unique strategies for HGR (hand signal acknowledgment) utilizing fingertips location. Another methodology called "Arch of Perimeter" is given its application as a virtual mouse. The framework exhibited, utilizes just a webcam and calculations which are created utilizing PC vision, picture and the video handling tool stash of Mat lab.

Guillaume Plouffe et al, [5] examined the advancement of a whiz signal UI that tracks and perceives progressively hand signals in light of profundity information gathered by a Kinect sensor. The intriguing space relating to the hands is first portioned based on the suspicion that the hand of the client is the nearest protest in the scene to the camera. A novel calculation is proposed to move forward the checking time with a specific end goal to recognize the main pixel on the hand from inside this space. Beginning from this pixel, a directional scan calculation takes into account the recognizable proof of the whole hand form. The k-arch calculation is then utilized to find the fingertips over the form, and dynamic time twisting is used to choose motion competitors and furthermore to perceive motions by contrasting a watched motion and a progression of pre-recorded reference motions. The examination of results with cutting edge approaches demonstrates that the proposed framework beats a large portion of the answers for the static acknowledgment of sign digits and is comparable regarding execution for the static and dynamic acknowledgment of well-known signs and for the communication through signing letter set. The arrangement at the same time manages static and dynamic motions also similarly as with various hands inside the intriguing space. A normal acknowledgment rate of 92.4% is accomplished more than 55 static and dynamic signals. Two conceivable utilizations of this work are talked about furthermore, assessed: one for the elucidation of sign digits and signals for friendlier human-machine cooperation and the other one for the normal control of a product interface.

Zafar Ahmed Ansari et al, [6] founded the individuals with discourse inabilities convey in gesture-based communication and accordingly experience difficulty in blending with the healthy. There is a requirement for a translation framework as a scaffold among them and the individuals who don't have the foggiest idea about their gesture-based communication. A utilitarian unpretentious Indian gesture-based communication acknowledgment framework was executed and tried on true information. A vocabulary of 140 images was gathered utilizing 18 subjects, totaling 5041 pictures. The vocabulary comprised for the most part of two given signs which were drawn from a wide collection of expressions of specialized and every day utilize starting points. The framework was executed utilizing Microsoft Kinect which empowers encompassing light conditions and question shading to have an irrelevant impact on the effectiveness of the framework. The framework proposes a technique for a novel, minimal effort and simple to utilize the application, for Indian Sign Language acknowledgment, utilizing the Microsoft Kinect camera.

Sonali N Jadhav et al,[7] investigates the different parts of hand sign images continuously using neural systems. Hand sign can be an indispensable path for the client to interface with any framework. In this framework, we catch a hand motion from the client and after that play out the activity identified with it. This gives us a choice to mouse and console to control a framework. Hand signal acknowledgment can be useful in different fields and territories were connecting with the framework without contact is imperative.

Vaishali.S.Kulkarni et al. [8] have introduced some objectives to build up a framework for the programmed interpretation of static motions of letter sets in American Sign Language. In doing as such three highlight extraction techniques and the neural system is utilized to perceive signs. The framework manages pictures of uncovered hands, which enables the client to interface with the framework in a common way. A picture is prepared and changed over to a highlight vector that will be contrasted with the component vectors of a preparation set of signs. The framework is a revolution because the scaling of interpretation variation of the signal inside the picture, which makes the framework increasingly adaptable.

Sabaheta dogic et al. [9] had studied that Sign language plays a great role as communication media for people with hearing difficulties. In developed countries, systems are made

to overcome the problem of deaf people. This encouraged to develop a system for the Bosnian sign language as per the requirement. It is a multilayer neural network using backpropagation algorithm. Images are processed by feature extraction methods, and by masking method, the data set has been created. Training is done using cross-validation method for better performance thus; an accuracy of 84% is achieved.

Noor Adnan Ibraheem et al. [10] had examined that Hand gesture is a method of non-verbal communication for human beings for its free expressions much more other than body parts. Hand gesture recognition has importance in designing an efficient human-computer interaction system. Using gestures as a natural interface benefited a motivation for analyzing, modeling, simulation, and recognition of gestures. In this paper, a survey was done on various recent gesture recognition approaches with particular emphasis on hand gestures. Few reviews for static hand posture methods are explained with different tools and algorithms, including connectionist models, hidden Markov model, and fuzzy clustering. Various challenges and future research directions are also highlighted.

3. Methodology used in proposed system

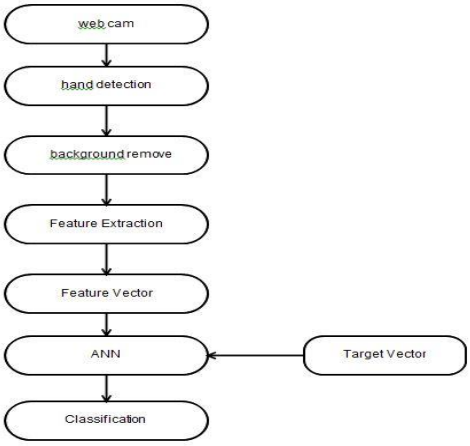

Fig. 1. System architecture

A. Image processing

An image is made up of RGB colors. The pre-processing unit consists of noise removal, greyscale conversion, binary conversion of images followed by feature extraction. In future extraction, five steps are followed in which fingertips search by eccentricity. Next elongations of images are measured by considering pixel segmentation as well as rotation of images.

B. Feature extraction

In feature extraction, the algorithmic study used to find the feature vectors of systematic results which combines K curvature and convex hull algorithms. In present work, "K convex hull" algorithm is used to detect fingertip with greater accuracy. In our system, the Artificial Neural Network (ANN) is used for future recognition in which we having the input unit of training data set of images.

C. Segmentation

Image segmentation is the way toward apportioning an advanced picture into various portions (sets of pixels). All pixels in an area share a typical property. Least complex property in which that pixel can share power. The objective is to disentangle and change the portrayal of the picture into something that is increasingly important and less demanding to break down.

D. Edge detection

Edge defines the boundaries between regions in an image which helps in object detection. There are many edge detection operators and algorithms available. Edge Detection Operators and Algorithms are used in our research like the Convex hull method.

E. Feature recognition

Brain-inspired systems used to replicate how humans learn. Consist of input, hidden and output layers that transform the input into something that the output layer can use. Excellent for finding patterns which are complex to human and teach the machine to recognize. ANN gathers their knowledge by detecting the patterns and relationships in data and learns (or is trained) through experience, not from programming.

4. Results and discussion

In Sign Language Recognition system, we have implemented a highly trained model that can accurately recognize hand gesture signs. In this system, we used Gaussian blur for grayscale conversion, Otsu's method for binary conversion of images after that we used convex hull for edge detection.

A. Grayscale conversion

In grayscale conversion, the color image is converted into a gray form using Gaussian blur. Colour image containing noise and unwanted background, which is removed or blurred by using this method.

Fig. 2. Gray image

B. Binary conversion

Grayscale image is given to input for Otsu's method for binary conversion. In Binary form of images converted in 0 and 1 form means black and white.

Fig. 3. Binary image

C. Edge detection

In Edge detection, the binary image gets dimensions by counters using a convex hull algorithm. In which eccentricity finding drawing edges around a white portion of the binary image.

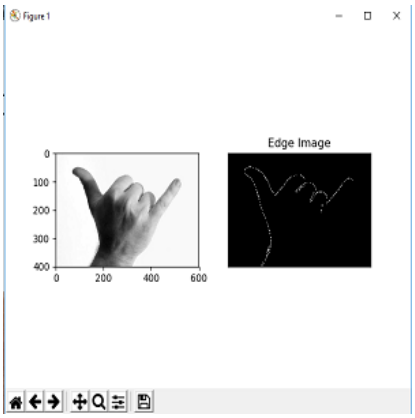

Fig. 4. Edge detection image

D. Training model

In our system, we are using tensor flow for extracting features of the training dataset. In which 87000 image samples are trained by using a training model. Finally, plot files are generated as an output of our trained model.

E. Testing model

In the final phase of data testing in which real-time hand gesture images matched by our training model with a higher percentage of accuracy.

After matching hand gestures, the respective alphabets are displayed on the console and stored in a text file as well. Finally, we have been used Google text to speech for converting into a voice.

Table 1
Modules of System

S. No.	No of Input Sign Sample's	Output Generated
1	1 to 5 Hand gesture Images	Fingertip counts 1 to 5
2	26 Hand gesture's	A-Z or a-z
3	n No of Words	Voice

In our experimental setup, in table 1 describe our system modules and respective generated output.

F. Comparative study graph

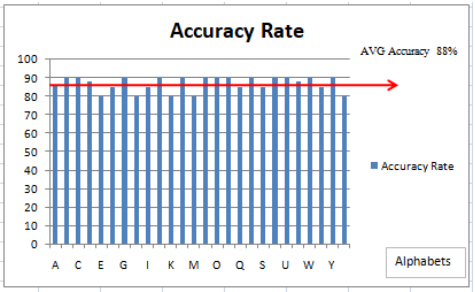

Fig. 5. Graph 1: Sign sample Average Accuracy Rate

G. Accuracy rate of sign recognition

All sign sample images trained by our trained model approximately 3000 images per alphabet. Total around 87000 images trained so we have been concluded the accuracy rate average 88%.

5. Conclusion

Thus, we implemented the Indian sign language system to accurately recognize the real-time hand gestures and generate alphabets to form words. Few algorithms are applied to achieve greater accuracy in the recognition system. Image samples taken by camera vision with the computer are tested by our trained ANN. Thus, we have achieved accuracy near about 80%.

References

[1] Sharmila Konwar, Sagarika Borah and T. Tuithung, "An American sign language detection system using HSV color model and edge detection", International Conference on Communication and Signal Processing, IEEE, April 3-5, 2014, India.

[2] Yo-Jen Tu, Chung-Chieh Kao, Huei-Yung Lin,"Human Computer Interaction Using Face and Gesture Recognition", Signal and Information Processing Association Annual Summit and Conference (APSIPA), 2013 Asia-Pacific, IEEE, Kaohsiung.

[3] Angur M. Jarman, Samiul Arshad, Nashid Alam and Mohammed J. Islam, "An automated Bengali sign language recognition based on fingertip finder Algorithm", International journal of Electronics & Informatics, 2015.

[4] Javeria Farooq and Muhaddisa Barat Ali, "Real time hand gesture recognition for computer interaction", International Conference on Robotics and Emerging Allied Technologies in Engineering (ICREATE), 22-24 April, 2014.

[5] Guillaume Plouffe and Ana-Maria Cretu, "Static and dynamic hand gesture recognition system in depth data using dynamic time warping" IEEE Transactions on Instrumentation and Measurement, Volume 65, Issue 2, Feb. 2016.

[6] Zafar Ahmed Ansari and Gaurav Harit, "Nearest neighbor classification of Indian sign language gestures using kinect camera", Indian Academy of Sciences. Feb 2016, p.p. 161-182

[7] Prof Sonali N Jadhav, Mrunmayi Deshpande, "A Real Time System for Hand Gesture Recognition", IJRITCC, February 2016.

[8] Vaishali. S. Kulkarni et al., "Appearance Based Recognition of American Sign Language Using Gesture Segmentation", (IJCSE) Vol. 02, No. 03, 2010, 560-565

[9] Sabaheta, Gunay Karli, "Sign Language Recognition using Neural Networks" TEM Journal, vol. 3, no. 4, 2014.

[10] Rafiqul Zaman Khan, Noor Adnan Ibraheem, "Survey on Various Gesture Recognition Technologies and Techniques," International Journal of Computer Applications, vol. 50, no. 7, pp. 38-44, July 2012.