International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

ONLINE HAND GESTURE RECOGNITION & CLASSIFICATION FOR DEAF & DUMB

Masanipalli Kranthi Kumar[1], Nagulanchi Raju[2]
Assistant Professor[1,2]
Department of Electronics and Communication Engineering
Malla Reddy Engineering College

Abstract-Sign language is widely used by individuals with hearing impairment to communicate with each other conveniently using hand gestures. However, non-sign-language speakers find it very difficult to communicate with those with speech or hearing impairment since it interpreters are not readily available at all times. Many countries have their own sign language, such as American Sign Language (ASL) which is mainly used in the United States and the English-speaking part of world. The proposed system helps non-sign-language speakers in recognizing gestures used in American Sign Language. The system described in this paper is implemented using MATLAB. In this approach, firstly, the signs are captured using a webcam. The images captured are then processed further and the features are extracted from the captured images using different structural features. Comparison of the features is done using SVM Classifier.

Index Terms-hand gesture, feature extraction, SVM classifier

I. INTRODUCTION

The use of sign language is not only limited to individuals with impaired hearing or speech to communicate with each other or non-sign-language speakers and it is often considered as a prominent medium of communication. Instead of acoustically conveyed sound patterns, sign language uses manual communication to convey meaning. It combines hand gestures, facial expressions along with movements of other body parts such as eyes, legs, etc. This paper proposes a design for recognizing signs used in ASL and interpreting them. Some of the challenges experienced by speech and hard of hearing people while communicating with normal people were social interaction, communication disparity, education, behavioural problems, mental health, and safety concerns. The ways in which one can interact with computer are either by using devices like keyboard, mouse or via audio signals, while the former always needs a physical contact and the latter is prone to noise and disturbances. Physical action carried by the hand, eye, or any part of the body can be considered as gesture. Hand gestures are the most suitable and easily interpretable for humans. Here, single handed gesture recognition system is proposed, it uses right-handed gestures, and are classified and recognized for the specific character. Static gesture recognition system proposed here does not require any color code. The sign recognition system proposed, recognizes the signs with great accuracy and with less overheads in

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

features and time. Since the introduction of the most common input computer devices not a lot have changed. This is probably because the existing devices are adequate. It is also now that computers have been so tightly integrated with everyday life, that new applications and hardware are constantly introduced. The means of communicating with computers at the moment are limited to keyboards, mice, light pen, trackball, keypads etc. These devices have grown to be familiar but inherently limit the speed and naturalness with which we interact with the computer. As the computer industry follows Moore's Law since middle 1960s, powerful machines are built equipped with more peripherals. Vision based interfaces are feasible and at the present moment the computer is able to "see". Hence users are allowed for richer and user-friendlier manDept. of ECE 1 MREC Online Hand Gesture Recognition & Classification for Deaf & Dumb machine interaction. This can lead to new interfaces that will allow the deployment of new commands that are not possible with the current input devices. Plenty of time will be saved as well. Recently, there has been a surge in interest in recognizing human hand gestures. Hand gesture recognition has various applications like computer games, machinery control (e.g., crane), and thorough mouse replacement. One of the most structured sets of gestures belongs to sign language. In sign language, each gesture has an assigned meaning (or meanings). Computer recognition of hand gestures may provide a more natural-computer interface, allowing people to point, or rotate a CAD model by rotating their hands. Hand gestures can be classified in two categories: static and dynamic. A static gesture is a particular hand configuration and pose, represented by a single image. A dynamic gesture is a moving gesture, represented by a sequence of images. We will focus on the recognition of static images. Interactive applications pose particular challenges. The response time should be very fast. The user should sense no appreciable delay between when he or she makes a gesture or motion and when the computer responds. The computer vision algorithms should be reliable and work for different people. There are also economic constraints: the vision-based interfaces will be replacing existing ones, which are often very low cost. A hand-held video game controller and a television remote control each cost about $40. Even for added functionality, consumers may not want to spend more. When additional hardware is needed the cost is considerable higher. Academic and industrial researchers have recently been focusing on analysing images of people. While researchers are making progress, the problem is hard and many present-day algorithms are complex, slow or unreliable. Thealgorithms that do run near real-time do so on computers that are very expensive relative to the existing hand-held interface devices.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

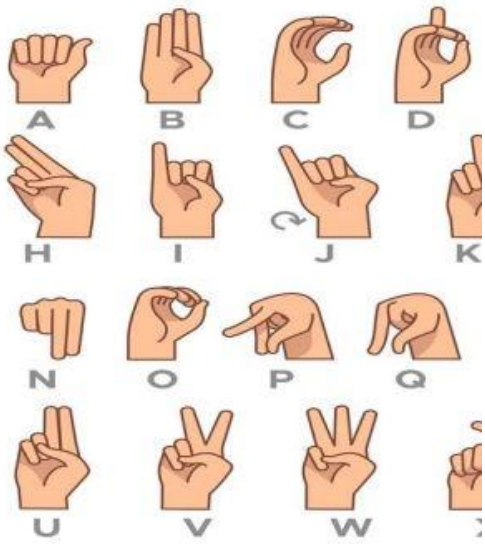

Fig 1. American Sign Language

II. Existing Work or Literature Survey

Many novel methods have been developed in past few years, to facilitate communication between the sign language users and those who can't speak sign language. Mrs. Neela Harish, Dr.S. Poonguzhali, proposed a system which depends on flex sensors, accelerometers output values such as, coordinates given by accelerometer and the bending values given by the flex sensors, for the interpretation of signs. Depending on the. Suganya R, Dr.T. Meeradevi, implemented a system using Feed Forward Neural Network, for identifying hand gestures characteristics & to train gestures captured. Dhananjai Bajpai, et al., proposed a system enabled to decode more than 36 gestures using 6 flex sensors, to recognize corresponding alphabets, or corresponding features. Pre-requisite for using this system to perform gesture recognition and store it in the database is not needed. Al-Ahdal and Tahir proposed a method using data glove and EMG Sensors for designing SLR. Hand muscles electromyography signals are recorded, for allocating words from streams of characters in continuous SLR. Research has been limited to small scale systems able of recognizing a minimal subset of a full sign language. Christopher Lee and Yongsheng Xu developed a glove-based gesture recognition system that was able to recognize 14 of the letters from the hand alphabet, learn new gestures and able to update the model of each gesture in the system in online mode, with a rate of 10Hz. Over the years advanced glove devices have been designed such as the Sayre Glove, Dexterous Hand Master and Power glove. The most successful commercially available glove is by far the VPL Data Glove.

III. WRITE DOWN YOUR STUDIES AND FINDINGS(Proposed Work)

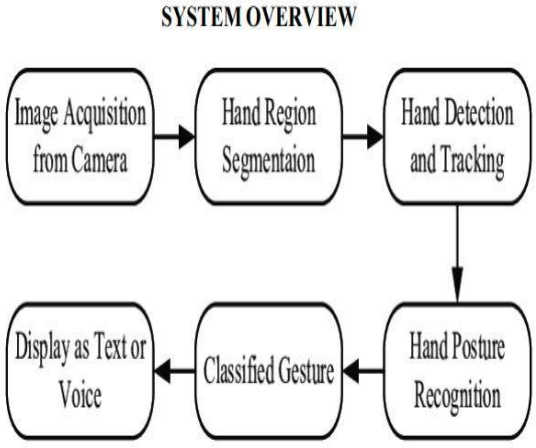

Fig 2. Block Diagram of hand gesture recognition system

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Vision based analysis, is based on the way human beings perceive information about their surroundings, yet it is probably the most difficult to implement in a satisfactory way. Several different approaches have been tested so far. • One is to build a three-dimensional model of the human hand. The model is matched to images of the hand by one or more cameras, and parameters corresponding to palm orientation and joint angles are estimated. These parameters are then used to perform gesture classification. • Second one to capture the image using a camera then extract some feature and those features are used as input in a classification algorithm for classification. In this project we have used second method for modelling the system. In hand gesture recognition system, we have taken database from standard hand gesture database, prima database. Segmentation and morphological filtering techniques are applied on images in pre-processing phase then using contour detection we will obtain our prime feature that is Local Contour Sequence (LCS). This feature is then fed to different classifiers. We have used three classifiers to classify hand gesture images.

Linear classifier is our first classifier and then we have used support vector machine (SVM) and least square support vector machine (LSSVM).

IV. RESULTS AND DISCUSSION(IF ANY)

Here are some tables displaying the results obtained from the program. Sign images of the same letter are grouped together on every table. The table gives us information about the pre-processing operations that took place (i.e., blurring, noise, translation) and also if the image belongs to the same database with the training images. The amount of each filter is also recorded so we can estimate the maximum values of noise the network can tolerate. This of course varies from image to image. The result also\ varies for every time the algorithm is executed. The variance is very small but it is there So we cannot easily draw conclusions and set a certain threshold above which we can tell that the network will not classify correctly. It all comes down to the application again. Form of results: The results come out of the network in column format. Each column is a classified image vector. The position of the '1' in the vector among the '0s' indicates which sign it is. Therefore, there should be only one '1' in every vector, but this is not always the case. As you will see from the tables below there are situations that the perceptron cannot converge to a single solution but it gives two possible solutions. In almost all of those cases one of the classifications is correct. There are few others though that the vector is not classified at all.

V. CONCLUSION

The idea of the project got started from a McConnell's idea of

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

orientation histograms. Many researchers found the idea interesting and tried to use it in various applications. From hand recognition to cat recognition and geographical statistics. My supervisor and I had the idea of trying to use this technique in conjunction with Neural Networks. In other approaches of pattern recognition that orientation histograms have been used different ways of comparing and classifying were employed. Euclidean distance is a straight forward approach to it. It is efficient as long as the data sets are small and not further improvement is expected. Another advantage of using neural networks is that you can draw conclusions from the network output. If a vector is not classified correct, we can check its output and work out a solution. As far as the orientation algorithm is concerned it can be further improved. The main problem is how good differentiation one can achieve. This of course is dependent upon the images but it comes down to the algorithm as well. Edge detection techniques are\ keep changing while line detection can solve some problems. One of the ideas that I had lately is the one of tangents but I don't know if it is feasible and there is not time of developing it. To say that I have come to robust conclusions at the end of the project is not safe. This is possible only for the first part of the project. Regardless of how many times you run the program the output vector will always be the same. This is not the case with the perceptron. Apart from not being 100% stable there are so many parameters (e.g., number of layers, number of nodes) that one can play with that finding the optimal settings is not that straight forward. As mentioned earlier it all comes down to the application. If there is a specific noise target for example you can work to fit these specifications. My major goal was speed and the avoidance of special hardware. This was achieved although it would be faster if written in C / C++ but the complexity of the design and implementation would have been much higher. MATLAB is slower but allows its users to work faster and concentrate on the results and not on the design. The thesis and the MATLAB source code will be available for download from the Surrey server.

References

[1] Mrs. NeelaHarish , Dr. S .Poonguzhali, "Design and development of hand gesture recognition system for speech impaired people", International Conference on Industrial Instrumentation and Control (ICIC) College of Engineering Pune, India. May 28-30, 2015.

[2] Suganya R, Dr.T.Meeradevi, "Design Of A Communication Aid For Physically Challenged",in IEEE Sponsored 2nd International Conference On Electronics And Communication System (Icecs 2015),2015.

[3] P Raghu Veera Chowdary, M Nagendra Babu, Thadigotla Venkata

Subbareddy, Bommepalli Madhava Reddy, V Elamaran, "Image Processing Algorithms for Gesture Recognition using MATLAB", IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), 2014.

[4] Meenakshi Panwar and Pawan Singh Mehra, "Hand Gesture Recognition for Human Computer Interaction", International Conference on Computing, Communication and Applications (ICCCA), Dindigul, Tamilnadu, India, Feburary 2012.

[5] Liton Chandra Paul, Abdulla Al Sumam, "Face Recognition Using Principal Component Analysis Method", in International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 1, Issue 9, November 2012.

[6] Adi Izhar Che Ani, Anis Diyana Rosli, Rohaiza Baharudin, Mohd Hussaini Abbas, Mohd Firdaus Abdullah, "Preliminary Study of Recognizing Alphabet Letter via Hand Gesture", in Computational Science and Technology (ICCST), 2014 International Conference, Kota Kinabalu, India, August 2014.

[7] M. Ebrahim AI-Ahdal & Nooritawati Md Tahir," Review in Sign Language Recognition Systems" Symposium on Computer & InfOlmatics(ISCI), pp:52-57, IEEE,2012 Sruthi Upendran, Thamizharasi. A, "American Sign Language Interpreter System for Deaf and Dumb Individuals" in International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), 2014.

A. Sharmila Konwar, B. Sagarika Borah, C. Dr.T.Tuithung, "An American Sign Language Detection System using HSV Color Model and Edge Detection", International Conference on Communication and Signal Processing, April 3-5, 2014.

[8] Pravin R Futane , Rajiv v Dharaskar, "Hasta Mudra And interpretatoin of Indian sign hand gestures", international conference on digital object identifier, vol.2, pp:377-380, IEEE ,2011.

[9] Adi Izhar Che Ani, Anis Diyana Rosli, Rohaiza Baharudin, Mohd Hussaini Abbas, Mohd Firdaus Abdullah, "Preliminary Study of Recognizing Alphabet Letter via Hand Gesture", International Conference on Computational Science and Technology (ICCST), 2014.