International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 07, July 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Indian Sign Language:Study of Existing Approaches

Aruna P.Phatale[1],V.B.Malode[2]

[1]*Department of Electronics & Telecommunication Engineering, (India)*

[2]*Jawaharlal Nehru Engineering College, Aurangabad, Maharashtra, (India)*

ABSTRACT

Communication plays a very important role in human life. Human express their ideas with communication. Communication can be done by using different ways. Normally communication is carried out with speech and gesture. But some people don't understand this language. So, to express their ideas they use a different language called Sign Language (SL). Sign language is used by deaf and dumb people known as differentially abled person. They use special symbols called sign and understand sign language. To recognize sign language different methods and techniques are used. In this paper, a critical review is made about the techniques which are used for recognizing sign into text. In this paper different techniques such as ANN, SVM, HMM are explained which are used in Feature extraction during the Sign conversion process. But every technique is not suitable for dynamic process. The objective of the proposed work is to efficiently recognize the two handed dynamic gesture of Indian sign Language of Deafness children at school level. Children face the problem in making sentences. So automatic recognizer tool using vision based method is proposed in this system. Image of child gesture will capture and then translate the same sign on display and also convert into speech. Data analysis is done using Labview software.

Keywords: *ANN, HCI, HMM, Labview, Sign Language, SVM.*

I. INTRODUCTION

Deaf and dumb people use their hand to express their ideas. Indian sign language differs in the syntax, phonology, morphology and grammar from other country sign languages. The gestures include the formation of English alphabet. Sign language is a combination of conventional gestures, hand signs and finger spelling, plus the use of hand positions to represent the letters of the alphabet. Signs can also represent complete ideas or phrases, not only individual words. There are different sign languages such as American Sign Language, British sign language, Korean sign language. [9] Communication is the exchange of information between two people. The act of transferring message between individuals using speech is known as verbal communication. While the act of transferring message using facial and hand gesture is known as a nonverbal communication. Deaf people can use nonverbal communication. They use sign language.

Sign Language emerges and develops naturally within deaf and dumb communities. Each sign language has its own grammar and rules, with a common property that they are all visually perceived. Sign language is the active area of the research involving pattern recognition, natural language processing, computer vision and linguistics. It becomes difficult to recognize because the signs are made with hands, facial expression and other part of our body.

There are three main approaches used in the sign language recognition that is glove based, color marker based

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

approach and vision based. In the first method, the user must wear the gloves which are not reliable because gloves carry a load of cables to connect the device to a computer. Table I summarizes different existing methods used.

Table 1: Different methods

SR.NO	METHOD	Author & Year	DESCRIPTION	Gestures Set
1	Gloves based	Abhishek Tandon et al 2016	It require Signer to wear a sensor glove. For that black Sleeves should wear so it Reduce aturalness of sign	Flex Sensor,accelerometer. Accelerometer increase accuracy and relability.
2	Color marker based	H.V.Anupreethi et al 2012 [8]	Improves naturalness and can wear any colored cloth, but still require hardware.	Glove based MEMs & Flex sensor with Labview but only for dumb not for deaf.
		Pratibha Pandey et al 2015[18]	Color gloves are useful to extract the feature to create new shape. Color are used to mark different region of different fingers.	Feature points located by different color such as left as Green color, Right as Blue color and Reference as Red color.It is not a natural though it is less expensive.
3	Vision based [add]	Agrawal et al 2012[1]	More suitable for real time application as it does not require any hardware	Two handed using Fusion of features HOG,shape descriptors and SIFT (92.6%)
		Adithya et al 2013[1]	Black background is considered.YCbCr Color space.ANN with backpropogation algorithm is used to compute difference between actual and expected result.	Finger Spelling Accuracy 91.11%
		Karishma Dixit, et al 2012 [16]	Hu invariant moment ans structural shape descriptors are used to form a new feature to recognize sign.MSVM is used for training and testing data.	96%

Such devices are expensive and reduce the naturalness of the sign language communication. In second method, colored gloves are used and the circuitry is inbuilt in the glove. So, it becomes easier for differentially abled persons to communicate with other people. In contrast, the vision based method requires processing of image features like texture, color, shape etc. In this the input to the system is an image or video which is captured from one or more cameras connected to the computer. Vision based method is more suitable for real time application. It is simple, natural and most important thing is that it is directly connected to the computer. [4]

Sign consists of three main features: 1. Manual feature –It involves gestures made with hands. 2. Non-Manual-It consists of facial expression or body posture which can both form a part of sign or modify the meaning of a manual sign. 3. Finger spellings- where words are split by gesture in the local verbal language for the word, whose sign we do not know.

According to the survey done by the government of India, it is reported that over 21 million of people in India suffer from some kind form of disability. Out of this 7.5% people have the disability of speech and 5.8% people face hearing disability. It is necessary that this part of our population should be equally treated as the rest of the society. This is achieved only when all these challenged people are given equal opportunities of education. To

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

build up the gap some additional efforts are required. More than 1 million of adult and 0.5 million children in India make use of Indian sign Language. But this number is very less. So, to increase this number, another system should be developed.

According to survey by taken government of India it is reported that over 21 million of people in India suffer from some form of disability. Out of this 7.5% people have disability with speech and 5.8% people face hearing disability. It is necessary that this part of our population should be equally treated as the rest of the society. This is achievable only when all these challenged people are given equal opportunities of education. To bring the gap some additional efforts require. More than 1 million of adult and 0.5 million children in India make use of Indian sign Language. But this number is very less. According to the profile year 2012 (People and Language Detail Profile) , around 173 Students (only 45.4%) use Indian sign language.

With a low literacy rate, advancement in school is extremely difficult. Only a few qualified interpreters are available in a few schools. When the education is primarily "oral", comprehension is much lower. A pool of trained interpreters does not exist. Interpreter training courses began in the year 2001 through the central government organization, (Ali Yavar Jung National Institute for Hearing Handicapped). Even if interpreters were available, the cost of hiring one, would likely be prohibitive for either parents or the schools.

Deaf and dumb youth's Greatest Needs (teens) is a better educational system with teachers and administrators trained in sign language. They need sign language to be used in classrooms along with oral methods. More schools could be developed for the Indian Deaf in cities that lack them. Indian Deaf teachers are needed. The Deaf may be trained as teachers of the Deaf, and few deaf teachers may be designated in each school for the Deaf. This would provide good adult Deaf role models as well as motivated and committed teachers. According to the profile year 2012 (People and Language Detail Profile),

Education Primary Schools 850

Primary School Enrollment 34,500

Secondary Schools 50

Secondary School Enrollment 1,500

Percent of Eligible Students Enrolled 2%

Most schools and clubs for the Deaf are located in cities; thus, the majority of the Indian Deaf in rural areas (59%) have no access to education.

Fifty-nine percent of the Indian Deaf live in rural areas without access to schools or deaf clubs (Government of India, Ministry of Social Welfare 1981). Schooling is not mandatory in India and in most cases the family must pay for school. Lot of research work is carried out in other sign languages. But a little work was done ISL at school level. Also, the initial work was carried out over small dataset which required large amount of data processing time. Already some work has been done on dynamic gesture. But it is not sufficient. Children who are both deaf and dumb are unable to understand the speech of teacher and fellow student. They face the problem in making sentences. It has become the need of the society to have an automated system which will recognize dynamic gestures.

Signs are either one handed or two handed. In one handed signs, only one hand is active at a time while in two handed signs, both hands are active and they may or may not touch each other. Sign language consists of words or finger spelling. Finger spelling is used to prepare words with the combination of letter coding. Letter by letter

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

sign can be used to express the views for which sign does not exist. But for finger spelling no signs are used. So, this is the key importance of Indian sign language. [1]

In two handed gesture while signing, some fingers or even a whole hand can be included. This is the major problem in the task of recognition.

1. Deaf and dumb people use their hand gestures when they want to communicate with normal people. But it is very difficult to understand the sign language for normal people. Currently, system is not available which can minimize the gap between normal and impaired people.
2. Static gesture can be easily recognized, but dynamic gestures are difficult to recognize. Also, there is no standard data set which everyone can use. For different application, different dataset is required. For education purpose, standard dataset is not available.
3. There is a little standard dataset is available in education field. That's why deaf and dumb children do not get education as normal children.
4. Majority of the people who were born deaf or who became deaf accidently early in life have only a limited vocabulary of spoken language. For them it is essential to create a standard dataset . The remaining paper is organized as Section III covers different techniques used. Section IV includes proposed method and section V describe the conclusion.

III. REVIEW OF VARIOUS TECHNIQUES USED

In sign language recognition classifier is required to classify the input sign. For Image segmentation and feature extraction different techniques are used in past papers. After Image segmentation feature vector is obtained. Then classifier will indentifies class corresponding to the sign. Various feature extraction methods used for recognition are Neural Network (NN), Support Vector Machine (SVM), Hidden Markov Models (HMM), Fuzzy logic and combination of Fuzzy and Neural network etc.

3.1 Skin color based segmentation techniques are widely used for segmentation of hands, faces etc. These techniques depend upon the color model used for segmentation. Segmentation using RGB color model, HSI color model and YCbCr color model are available. In India, there is variation in human skin color so to detect color is a big challenge HSV and YCbCr color gives better result for skin color detection. Chrominance component. Some researcher used additional marker or color gloves for hand segmentation using color thresholding, but for natural interface bare hand interaction is always preferred. [1] Supervised as well as Unsupervised Learning Model such as Bayesian classifier can be used for skin color segmentation. Unsupervised learning such as, K-mean clustering is also a good option for skin color segmentation. 2D Tracking algorithm gives the position information of hand such as color tracking, motion tracking, template matching, blob tracking, [3]

3.2 Hidden Markov Model (HMM) is one of the most successful and widely used tools for modeling signals with spatial temporal variability. It has been successfully applied in speech recognition and is one of the most successfully used methods in the research area of dynamic gesture recognition. [13] It is collection of finite states connected by a transition. Each set is characterized by two set of probabilities either a continuous or discrete probability. It gives set or defines condition probability of emitting each output symbol from a finite alphabet or a continuous random vector. By using HMM gestures are converted into sequential symbols and

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

their parameters are learned from training data [4]. Gestures can be recognized by evaluating trained HMM. It is an easy and straight forward manner for gesture classification. HMM has high classification rate. So, it is used for dynamic gesture classification HMM is used to sense the point's gesture and after that it uses Gaussian Process Regression to calculate approximating point direction. [5].

3, .3. Artificial Neural Network (ANN): - It is a technique in which output of one node becomes input of another. An artificial neural network is a computational model inspired by the neural structure input exceeds a predefined threshold value the neuron is activated and it emits a signal through the axon. This signal is sent to another synapse to activate other neurons [1]. In neural network training is used to configure a set of inputs which produces a set of desired outputs . Many different algorithms used to train the inputs. The most commonly used algorithm used is back propagation algorithm. It computes the difference between actual and expected results and this error is propagated backwards. So, it tries to minimize this error until the neural network learns the training data. By using KNN and decision tree different isolated signs can be recognized. [5] [11]. This is suitable for static hand gesture but difficult for dynamic hand gesture.

3.4 Support Vector Machine (SVM):-It is popular pattern matching with supervised learning. It divides the feature space for each class. It can handle unknown data well but it is not suitable for grouping sample data. It takes a set of input data and predicts for each given input which of two possible classes from output. [4] SVM can be used for linear and nonlinear classification. The machine conceptually implements the following idea: input vectors are nonlinearly mapped to a very high dimensional feature space. In this feature space a linear decision surface is constructed. Special properties of decision surface ensure high generalization ability of the learning machine. The idea behind support vector was previously implemented for the restricted case where the training data can be separated without errors. [14]

Support Vector Machine can be modified for reduction of complexity. Reduction of complexity leads us to a less computation time. Reduced complexity provides us less computation time so we can make the system work real time. The applications of hand gesture recognition are for non-verbal communication between human and computer, general fit person and physically challenged people, 3D gaming, virtual reality etc. [7]

This is not applicable for continuous gesture.

3.5 Fuzzy logic: - Fuzzy logic is a multivalve logic where it gives two solutions either true or false or Yes/No or High/Low. Depending on this the finger position can be determined and the sign can be recognized upon position of thumb finger and index finger. [7] Fuzzy logic is a paradigm which can alternatively design for linear and nonlinear system for embedded control application. Fuzzy logic is used in system control and analysis design. Fuzzy logic is structured model free estimator that gives the relation between input/output association and it provides an easy way to arrive at a definite conclusion. Fuzzy Logic is used for edge detection. It is an essential feature of digital image processing. [10]

3.6 Distance Transform method: - ISL alphabets can be recognized by the angles between the fingers, position of the finger mean fingers are fully open, fully closed or semi closed. After capturing the image of gesture of hand it is converted into frames by using color segmentation. Then distance transformation is used to identify the centroid, based on this centroid the palm region is extracted by eroding the appropriate structuring element. Then the finger region is calculated. From the number of extracted region, the number of the finger is identified. From this number of fingers open, closed, semi closed is determined. Horizontal line is considered as

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

a reference line and angle is measured. These features are used to recognize the alphabet. [2]

By adding FLEX sensor with MEMs accelerometer gives better solution for sign language recognition.

Different transform techniques are used. Neural Network HMM is used for static gestures but difficult for hand gestures. Skin color based segmentation gives accurate result for Black background. YUV color space is good and cheapest method for dynamic gesture. HMM will give more accuracy for dynamic gesture. ANN is the easiest and simplest method for static images but has a minimal error rate. SVM is not suitable for grouping the data, though it can handle unknown separate data. All existing techniques use MATLAB software.

IV. PROPOSED METHOD

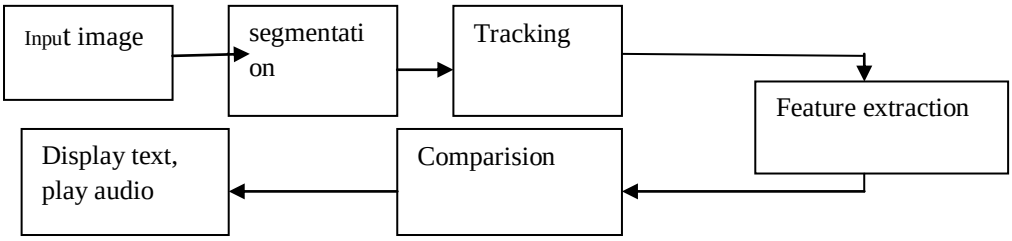

Fig.1: Block diagram of proposed method

In this proposed system vision based hand gesture is considered. It provides removal of background noise, segmentation, detection of hand. Dynamic recognize the words or sentences of different sign languages. Mainly three steps are important in sign language recognition. Preprocessing, Feature extraction and classification.

The objective of the proposed work is to efficiently recognize the two-handed dynamic gesture of Indian sign Language of deafness children and then translate the same sign on display and convert into speech. Computer vision based method is proposed for this system.

Also, there are two types of gestures one is Static and other is Dynamic. In static gesture, it recognizes only alphabet and numerals. Static gestures can be recognized by Image processing. But in dynamic it tries to recognize word. So, there is a need to develop a system which will automatically recognize the word generally used in communication.

Some database for dynamic gesture such as “Study, Triangle, Model, and Coat, Bird” can be recognized using database. But this dataset is not sufficient for deaf and dumb people to communicate with normal people.

So, it is necessary to increase the dataset which require in education process. Deaf and dumb people can easily communicate with normal people and they do their own work independently.

In the proposed system, dataset is increased and should be particularly used in education area.

Image processing is used to acquire the image. Then it is followed by segmentation and hand tracking. First, Image is captured by using a web camera. It considers not only hand movement but facial expression also. Then, Image segmentation is done by using YUV color space model. The image of hand and face with its background is considered. Using Hand tracking, the background is subtracted. So, only image of hand and face is considered. Then for feature extraction HMM is used and then it compares the image of hand and face with dataset which is stored in LabView SQL spreadsheet. After Template matching the result is displayed on LabView in Text format as well as the image of hand gesture. Using Speech to audio the meaning of hand

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

gesture or text is done.

In software, Lab view is used. LabView is a graphical programming environment used to develop sophisticated measurement, test and control systems using intuitive graphical icons Analysis is done with the help image processing and result is displayed on LabView. provides hundreds of built in libraries for advanced analysis and data visualization- all for creating virtual instruments Data base is stored in Data Acquisition (DAQ). In Lab view GUI, the dynamic gesture will be compared with dataset. If it matches, then it will display the meaning of image in text. First data is trained. Then it tests with dataset which is stored. If the text is matched then it will convert that text into speech with that sign. Accuracy can also be determined. Thus, normal people will be able to understand the sign language. It will decrease the gap between normal and deaf and dumb people.

V. CONCLUSION

This paper basically deals with the existing techniques used in classification. Some techniques are used for static hand gesture, some for dynamic. This paper focus on proposed system which will recognize dynamic gesture of deafness children at school level. Dynamic gesture of deafness children can be identified and its meaning is display on Labview software. GUI of Labview software is powerful. Hence, an automatic system is proposed, which can be used at school children who are deaf and dumb. The proposed system can be useful in real time application with any background color, and is well suited for static as well as dynamic gesture. The deafness children can make the sentence and easily communicate with teacher and fellow student.

REFERENCES

[1] Subhash Agarwal ,Ana Jalal, Chand Bhatnagar.”Recognition of ISL using Feature Fusion “IEEE Proceeding of 4th International Conference on Intelligent Human Computer Interaction 27-29,2012

[2] Adithya V., Vinod P.R., Usha Goplakrishnan, “ Artificial Neural Network Based method for Indian Sign Language Recognition” Proceeding of 2013 IEEE Conference on Information and Communication Technologies (ICE 2013)

[3] Shangeetha R.K. , Valliammai V., Padmavathi. S. “Computer Vision based for Indian Sign Language Character Recognition” ,IEEE 2012,

[4] G. Yang, H. Li, L. Zhang and Y. Cao ,”Research on skin color detection algorithm based on self adaptive skin color model” IEEE International Conference on Communication and Intelligence Information, Oct.2010, 260-270.

[5] Anuja V. Nair, Bindu V.”Ä Review on Indian Sign Language Recognition”, International Journal of Computing Applications, Vol.73-No-22,July 2013.

[6] Deepika Pahuja,”Critical Review on Techniques for Sign Language Recognition” International Journal Of Science , Technology & Management Vol.No.4, Special Issue No.01, April 2015

[7] Yellapu Madhuri,Anitha G, Anburajan M. ”Vision based Sign Language Translation Device”

[8] H.V.Anupreethi,S. Vijayakumar,”MSP430 based Sign Language Recognizer for Dumb Patient”, ELSEVIER ,SciVerse Science Direct, International Conference on Modelling Optimization and Computing., Procedia Engineering 38(2012) 1374-1380.

[9] ShwetaDour,Dr.M.M.Sharnma,”Recognition of Alphabets of Indian Sign Language by Sugeno type Fuzzy

IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Neural Network" ,International Journal of Science and Research Publications , Volume 6, Issue 3, March 2016

[10] Geetha M.Aswathi P.V.M.R.Kaimal,"A Stroke based representation of Indian Sign Language Signs incorporating Global and Local Motion information",2013 Second International Conference on Advanced Computing, Networking and security.

[11] P.V.V. Kishore and P.Rajesh Kumar,"A Video based Indian Sign Language Recognition System Using Wavelet Transform and Fuzzy Logic

[12] Madhruri Sharma, Ranjna Pal, Ashok Kumar Sahoo." Indian Sign Language Recognition Using Neural Networks And KNN classifiers" ARPN Journal of Engineering and Applied Science,Vol.9 No.8,August 2014

[13] Archana Ghotkar, K.Gajanan, Gajanan Kharate, "Study of vision based hand gesture "Recognition using Indian sign language", International Journal on Smart Sensing and Intelligent System, Vol. 7,No.1 March 2014.

[14] Suruchi Bhatnagar, Suyash Agarwal "Hand Gesture Recognition for Indian Sign Language: A Review",Internatioanl Jornal of Computer Trends and Technology ,Vol 21,Number 3-Mar 2015.

[15] Nagashree R N1 , Stafford Michahial1 , Aishwarya G N2 , Beebi Hajira Azeez2 ," Hand gesture recognition using support vector machine" The International Journal Of Engineering And Science (IJES) ,Volume 4, Issue 6 PP.42-46 , June – 2015.

[16] Karishma Dixit, Anand Singh Jalal " Automatic Indian Sign Language Recognition System",IEEE 2012,.

[17] Geetha M. Aswathi P.V, M.R. Kaimal,"A stroke based representation of Indian Sign Language Signs incorporating Global and Local motion information", IEEE 2013 Second International Conference on Advanced Computing, Networking ans Security.

[18] Partibha Pandey, Vinay Jain, "Hand Gesture Recognition for Sign Language Recognition :A Review", IJSETR ,Vol.4, Issue 3, March 2015.