SignReco: Sign Language Translator

Samir Mendhe[1], Rounak Bawankule[2], Amisha Udapurkar[3], Ria Gogiya[4], Anjali Gaikwad[5], Jaspreet Kaur Saggu[6]

[1]*Professor, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*
[2]*Student, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*
[3]*Student, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*
[4]*Student, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*
[5]*Student, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*
[6]*Student, Department of Computer Science and Engineering, S.B. Jain Institute of Technology, Management and Research, Nagpur, Maharashtra, India*

---***---

Abstract - *Normal human beings can easily interact and communicate with each other but a person with hearing and speaking disabilities while communicating with normal people without a translator. Sign language is a visual language used by the people with the speaking and hearing disabilities for communication in their daily conversation activities. This is the reason that the implementation of a system that recognize the sign language would have a relevant benefit impact on dumb - deaf people. Here the sign gestures or text would be the input and corresponding description or signs would be the output respectively. In the proposed approach the main focus is on the classification and recognition of the Indian Sign Language given by the user in real-time. For classification, CNN and neural network are used.*

Key words: Indian Sign Language, neural network, CNN.

1. INTRODUCTION

Most of typical individuals know nothing about the semantics and rules of communication through signing, delivering correspondence is truly challenging between a normal individual and a discourse debilitated or hearing-impeded person in a large portion of the cases. The hard of hearing local area in India particularly in districts of low monetary flourishing still face significant difficulties in conquering marks of disgrace against communication via gestures. Till this point, no proper acknowledgment of Indian Sign language by government organizations. There is a high potential for fostering an application for communication via gestures interpretation and is basically helpful to connect the correspondence hole between the conference larger part and the hard of hearing and moronic networks. While word reference like web and

portable applications exist to decipher English letters and words into signs, generally not very many free or openly accessible applications have been delivered to change over communication through signing signals into English as of now.

Deaf individuals don't have that numerous choices for speaking with an ordinary individual and each of the options really do have significant blemishes. Interpreters aren't typically accessible, and furthermore could be costly. Pen and paper approach is only a poorly conceived notion since it is truly awkward, untidy, time consuming for both deaf and ordinary individuals. Wyhowski noticed that couriers and messaging are somewhat better, however they don't tackle the issue, which is interpretation, and don't offer simple certain and agreeable method for imparting. A sign language is a language which, rather than acoustically conveyed sound examples, utilizes outwardly communicated sign examples to convey meaning - all the while consolidating hand shapes, direction and development of hands, arms or body, and look to smoothly offer a speaker's viewpoint.

Deaf individuals exist in all regions of the planet. Any place the networks of deaf individuals exist, sign languages consequently becomes an integral factor. Worldwide various languages have been advanced as ASL (American Sign Language) in America or GSL (German sign language) in Germany or ISL (Indian sign language) in India. There are principally two distinct inspirations for creating sign language acknowledgment model. The main angle is the improvement of an assistive framework for the deaf individuals. For instance advancement of a characteristic info gadget for making sign language records would make such reports more coherent for deaf individuals. In addition ordinary individuals experience

issues in learning sign language and in like manner most of those individuals who were conceived deaf or who became deaf from the get-go throughout everyday life, have just a restricted jargon of understanding communicated in language of the local area in which they live. Subsequently a means of making an interpretation of sign language to communicated in language would be of incredible assistance for deaf as well with respect to ordinary individuals. A subsequent perspective is that sign language acknowledgment fills in as a decent reason for the improvement of gestural human-machine interfaces.

1.1 Goals or Objectives:

- To provide Sign Language Recognition system to remove the barrier of communication
- To provide Sign language learning platform for users
- To provide Multilingual Support for users
- To provide audio as well as text conversion of sign - language.

2. LITERATURE SURVEY

"Understanding human motions can be posed as a pattern recognition problem." This paper addresses a system for a human PC interface fit for perceiving signals from the Indian sign language. The intricacy of Indian sign language acknowledgment framework increments because of the association of both the hands and furthermore the covering of the hands. Letter sets and numbers have been perceived effectively [1].

"A novel approach to recognize the Indian sign language using Artificial Neural Network (ANN) and Support Vector Machine (SW)" In this paper the framework can be utilized to comprehend the significance of Indian communication through signing. Skin division is used to get state of the hand area, Euclidean distance change is utilized to make dark level picture and feature vectors are made utilizing feature extraction. For feature extraction Central moments and HU moments are utilized. Artificial neural organization is utilized to characterize the sign which gives normal accuracy of 94.37% and SVM classifier for similar gives accuracy of 92.12%. Both the classifiers give higher accuracy with 13 features. ANN gives better accuracy even with less number of feature set[2].

"American Sign Language Recognition System: An Optimal Approach ",In this research paper, introduced an ideal methodology, whose significant goal is to achieve the literal interpretation of 24 static gesture based communication letters in order and quantities of American

Sign Language into humanoid or machine understandable English original copy. Pre-handling tasks of the marked information signal are done in the principal stage. In the following stage, the different district properties of pre-handled motion picture is processed. In the last stage, in light of the properties determined of before stage, the literal interpretation of marked motion into text has been done. This paper likewise gives the factual outcome assessment the near graphical portrayal of existing procedures and proposed strategy[3].

"Selfie video based continuous Indian sign language recognition system" A conventional information base of 18 signs in consistent gesture based communication were recorded with 10 distinct underwriters. Pre-filtering, segmentation and contour detection are performed with Gaussian filtering, sobel with versatile square thresholding and morphological deduction separately. Hand and head contour energies are highlights for grouping processed from discrete cosine change. Execution speeds are improved by removing rule parts with guideline part examination. Euclidian, standardized Euclidian and Mahalanobis distance measurements arrange sign elements. Mahalanobis distance arrived at a normal word matching score of around 90.58% reliably when contrasted with the other two distance measures for a similar train and test sets[4].

"Sign Language Recognition via Skeleton-Aware Multi-Model Ensemble" they constructed a novel 2D and 3D spatio-temporal skeleton graphs using pre-trained whole-body key point estimators and propose a multi-stream SL-GCN to model the embedded motion dynamics. they proposed SSTCN to predict using skeleton features. Furthermore, they did study of the multi-modal fusion problem based on the other modalities (i.e., RGB frames, optical flow, HHA, and depth flow) via a learning-based late-fusion ensemble model named GEM [5].

"Classification of Sign Language Gestures using Machine Learning." The application programming for communication through signing acknowledgment was achievement completely created utilizing AI procedures. The product was prepared for 24 static fingerspelling signals. The framework can sufficiently perceive specific fingerspelling signs with sensible accuracy. Notwithstanding, it couldn't recognize all characters in view of little dataset and mistakes in skin division. It tends to be closed from the outcomes talked about over that for grouping utilizing video, the exhibition relies on lighting and skin masking accuracy [6].

"Hand Talk Translator App", Driven by Hugo, the Hand Talk app naturally makes an interpretation of text and sound to American Sign Language (ASL) [Beta] and Brazilian Sign Language (Libras) through man-made brainpower. The Hand Talk app is an integral asset, utilized in the most different settings: 1) In the study hall, by educators, understudies and mediators as a correlative correspondence asset. 2) At home, by families with hard of hearing and hearing individuals. 3) By sign language understudies that need to work on their jargon with Hugo's Help [7].

"Ace ASL App", The framework utilizes a camera to perceive signing and give criticism. Ace ASL app depends on the very sign acknowledgment innovation that makes conceivable robotized and unconstrained interpretation between American Sign Language and English. The versatile application is the principal ASL learning app to give constant criticism on signing. The application incorporates a learning segment, organized as units. Tests toward the finish of every unit take into account fast and simple self-appraisal. Open practice works on clients' capacity to perceive fingerspelling from others in three distinct rates: simple, medium and progressed [8].

"App GnoSys", A Netherlands-based fire up has fostered a man-made brainpower (AI) controlled smartphone app for deaf and mute individuals, it offers a minimal expense and better approach than making an interpretation of gesture based communication into message and discourse progressively. The simple to-utilize imaginative advanced mediator named as "Google interpreter for the deaf and mute" works by putting a smartphone before the client while the app deciphers signals or communication via gestures into message and discourse. The app, called GnoSys, utilizes neural networks and computer vision to perceive the video of communication through signing speaker, and afterward smart calculations make an interpretation of it into discourse[9].

2.1 Real-Time Survey:

Saksham NGO, Nagpur: Samadrishti, Kshamata Vikas Evam Anusandhan Mandal (SAKSHAM) is a charitable national organization was established with an aim to bring all the persons with various disabilities in the main stream of our nation.

2.1.1 Problems:

1) It is difficult for people who are unaware of sign language to communicate with deaf-mute people.

2) Indian Sign Language Recognizing system are not developed. So, deaf-mute people faces issue with American Sign Language (ASL) systems

3) It is difficult for people only aware of regional language to understand ASL.

2.1.2 Solutions:

1) Users will be able to convert the text to sign language into text by using real time camera recording. With text to sign language converter.

2) We are developing Indian Sign Language Recognizer.

3) We are including multilingual converted for our sign language text and audio.

3. PROPOSED WORK

3.1 Flow of the System:

The user will start by choosing the type of conversion they want. For converting sign-to-text, the user will choose accordingly which will open the camera. The sign language will be scanned by the camera and will be decoded by the ML model. It will be converted to text or audio by using a text-to-speech algorithm. The text obtained can further be converted into different regional languages provided in the app. At the same time, we can also convert the text to a series of images representing signs corresponding to the sentence i.e. Text-to-sign conversion which can be used by the user to convey it to deaf-mute people or to learn the sign language.
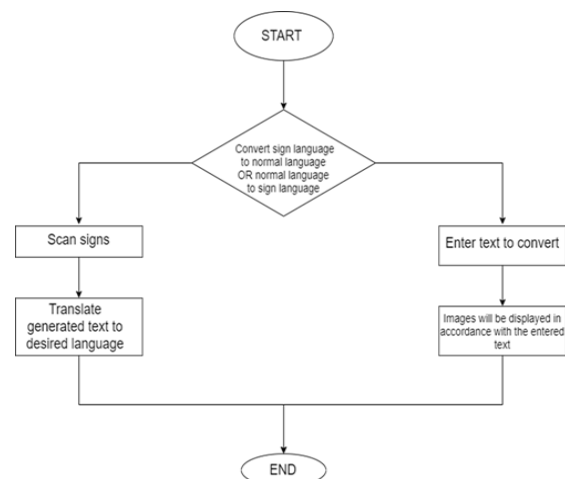

Fig. 1: Flowchart

3.1.1 Functional Modules:

The whole system is divided into three modules
    i)   Model creation
          - Data collection and pre-processing

- Model training and testing
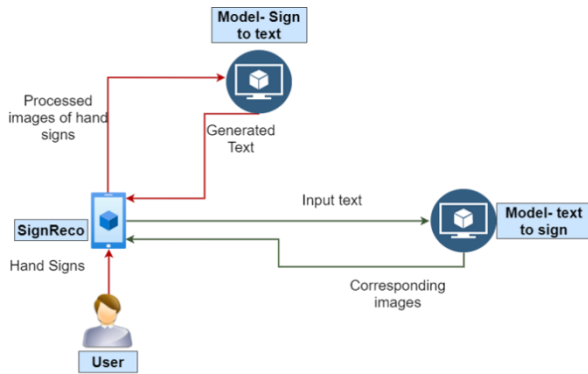ii)   Language Translation.
iii)   App development

Fig. 2 . Architecture of app

1) Model creation training & testing.

This module includes sub-modules such as image pre-processing for sign language recognizer with the implementation of its other features using machine learning and deep learning and it also includes testing of the modules.

Image Pre-processing: In the pre-processing of images, we first converted the image to a grayscale image to remove the RGB channels from the image. Then we applied Gaussian blur to the grayscale image which gave us an outline of the hand sign from the image. This process reduces the features of the image which in turn reduces the training time and increases efficiency.

Image: Hand sign for alphabet "A" from data set

Image: Pre-processed Image

2) Language translation.
In this module, we are going to add multilingual support for users from various regions of the globe. Users can convert sign language to multiple language text and audio through this module.

3) App development.
In this module, we will integrate the machine learning module of sign language recognizer into the android app.

This module also includes the designing of the GUI of the app.

4. CONCLUSION

This Survey helps in developing an approach for Indian Sign Language Recognition System. It has helped to explore various approach that has previously developed for Sign Language Recognition System. With this survey and study, we have proposed an effective approach for Recognition system using CNN from which we can increase the accuracy of recognition.

Our approach will have features of converting text to signs, translation of text to multiple languages and converting text to speech. This system will help deaf-mute people to communicate signs effectively to others.

REFERENCES

[1] "Understanding human motions can be posed as a pattern recognition problem.", Divya Deora, Nikesh Bajaj, 2012 1st International Conference on Emerging Technology Trends in Electronics, Communication & Networking Department of Electronics Engineering, Z.H.College of Engineering and Technology, Aligarh Muslim University, Aligarh, India

[2] "A novel approach to recognize the Indian sign language using Artificial Neural Network (ANN) and Support Vector Machine (SW)", Yogeshwar Ishwar Rokade, Dharmsinh Desai University, Indian Sign Language Recognition System, July 2017International Journal of Engineering and Technology 9(3S):189196,DOI:10.21817/ijet/2017/v9i3/170903S030

[3] "American Sign Language Recognition System: An Optimal Approach " Shrivashankar S, Srinath S," International Journal of Image, Graphics and Signal Processing(IJIGSP), Vol.10, No. 8, pp. 18-30, 2018.DOI:10.5815/ijigsp.2018.08.03

[4] "Selfie video based continuous Indian sign language recognition system", G. Ananth Rao, December 2018

[5] "Sign Language Recognition via Skeleton-Aware Multi-Model Ensemble",Songyao Jiang, Bin Sun, Lichen Wang, Yue Bai, Kunpeng Li and Yun Fu Northeastern University

[6] "Classification of Sign Language Gestures using Machine Learning."Abhiruchi Bhattacharya', Vidya Zope, Kasturi Kumbhar, Padmaja Borwankar', Ariscia Mendes B.E.. Computer Engineering Department, VES Institate of Technology, Mumbai,

India [1]8.45 Assistant Professor, Computer Engineering Department, VES Institute of Technology, Mumbai, India, International Journal of Advanced Research in Computer and Communication Engineering, Vol 2, Issue 12, December 2019

[7] "Hand Talk Translator App", Led by Hugo

[8] "Ace ASL App"

[9] "App GnoSys", A Netherlands-based start-up has developed an artificial intelligence (AI) powered smartphone app.