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# ENABLING THE DISABLED USING MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING

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**Abstract -** Humans communicate with each other through natural language channels such as words and writing, or through body language (gestures) such as hand and head gestures, facial expression, lip motion, etc. There are some examples of natural languages that people use to communicate with each other. We all know that understanding natural language is essential, learning sign language is also very important. For disable people, sign language is the primary communication method for hearing. As there is no translator for communicating among them, so they face problems in communicating. So this is the motivation for us to create a system that recognizes sign language to impact deaf people's social lives significantly.

***Key words*: Haar Cascade Classifier, American Sign Language(ASL), Natural Language Processing(NLP), Computer Vision, Deep Learning, Convolutional Neural Network(CNN), Python**

## 1. INTRODUCTION

People with hearing and speaking disabilities communicate using sign language, but not everyone is aware of the language. As a result, there is a disconnect and a lack of communication.

Sign language is a method of communication that involves the use of the hands and other body parts. It is not to be confused with nonverbal communication. Deaf people rely heavily on sign languages to communicate. They are sometimes used by deaf people in place of spoken languages. Spoken languages are understood through the ears and rely on sounds produced by the mouth. Sign languages are written with the hands and read with the eyes. Sign languages are easier for deaf people to learn than spoken languages [2]. According to the World Health Organization, 466 million people worldwide have debilitating hearing loss, with 34 million of them living in the United States who are adolescents.

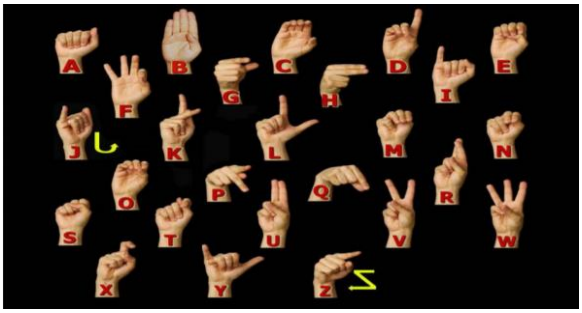


*Fig 1- Types of Handshakes*

We will be using American Sign Language (ASL), where American Sign Language (ASL) can be defined as an absolute, natural language with the similar linguistic properties as languages which are spoken along with grammar that is different from English. Motion of the hands and face express ASL. It is the predominant language of many deaf and hard-of-hearing people in North America, as well as many hearing people.

However, there is an urgent need for developing efficient interactive communication tools for signers with the help of computers is to be met. We believe that it will benefit deaf and hard hearing people by offering them a flexible communication alternative when face-to-face communication is not available. We will present an American Sign Language (ASL) recognition system that uses Machine Learning, Deep Learning, Image processing, Natural language processing, Computer vision, and Audio processing in real-time to translate a video of a user's ASL signs into text and then audio to reduce this barrier and allow dynamic communication.

This system will definitely contribute to society by helping physically Indian disabled people. This system will act as an auxiliary tool for a deaf-mute to communicate with ordinary people through computers. Thus, this system's major objective is to make possible the communication between

deaf people and the rest of the world in daily life. Since there are very few proficient sign language tutors at schools for the deaf, the teaching and learning process lags. In such cases, the system is used for sign language education purposes, where any person can learn or practice sign language[1].

## 2. PROBLEM STATEMENT

Sign language: a natural, linguistically complete, and primary medium for humans to interact. People who are deaf, dumb, or blind are increasingly using this language. Hearing loss affects 466 million people worldwide, with 34 million of them being girls, according to the World Health Organization (WHO). Deaf people face many challenges and barriers when it comes to communicating. However, since the signers are unfamiliar with traditional sign language, it has a negative impact on their social relationships. A much more sophisticated form of communication than interpreters or writing is needed. Our aim is to create a system that will translate video of commonly used full sentences of American Sign Language (ASL) gestures into text, which will then be converted to audio. To get the most reliable result and refine the algorithm to detect results as easily as possible, various Machine Learning models are being used. This project will focus on developing the model and its deployment so that, most simply, a result can be interpreted as possible for a larger audience to use it.

## 3. OBJECTIVES

Our objective is to perform an efficient execution system, more optimized system and multiple inputs support videos and images.

## 4. DELIVERABLES

The system will take an image and will produce output as a single character. Natural Language processing takes a set of characters and generates a complete statement. Then, this statement will be converted to an audio format.

## 5. LITERATURE SURVEY

The World Health Organization (WHO) projected the number of people with debilitating hearing loss in 2020 and 2050.

WHO estimates that:

1. Disabling hearing loss affects 466 million people worldwide (6.1 percent of the global population).
2. Children make up 34 million (7%) of the total population of 432 million (93%) adults (242 million males, 190 million females).
3. Disabling hearing loss affects about a third of the population over the age of 65.
4. In the coming years, the number of people with debilitating hearing loss is expected to rise. According to projections, the population will reach 630 million by 2030, and possibly over 900 million by 2050.

## 6. PROPOSED SYSTEM

Humans interact with one another using natural language networks like words and writing, as well as body language (gestures) like hand and head gestures, facial expressions, lip motion, and so on. People use natural languages to communicate with one another in a variety of ways. We all know how important it is to understand natural language, but learning sign language is also crucial. For hearing-impaired individuals, sign language is the predominant mode of communication. They have difficulty communicating because there is no interpreter available to them. As a result, we are motivated to develop a framework that understands sign language in order to have a positive effect on deaf people's social lives.

The first step is to capture the live video. Here the system will detect palm using Haar Cascade Classifier.

The second step is the processing stage. Here we will take the coordinates of the detected part of the output from the Haar Cascade Classifier, and then we will assume that section of the image and then denoise it, and then we will enhance the image. Now we will give the shot to the Neural network and produce output as a single character. For multiple frames, a proper word will be generated. By iterating the same process, a collection of words will be generated. These words will be combined to create meaningful statements. This statement will be given as an

input to the audio processing engine, giving out an audio output. Also, using deep neural networks, we will train our model.

The third step is the output which includes audio and text. This audio will be generated using audio processing, and the text will be displayed from NLP output.

## 7. FLOWCHART

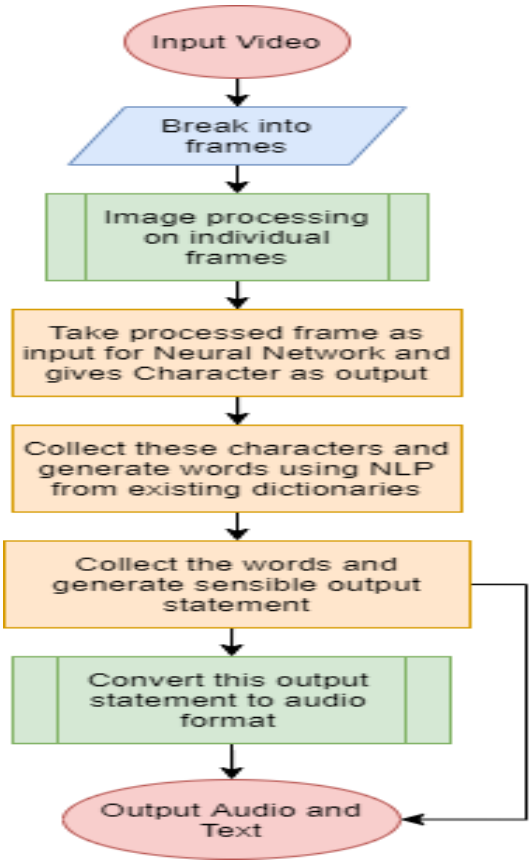


*Fig 2- Flowchart of Sign Language Recognition*

## 8. DATA FLOW DIAGRAM

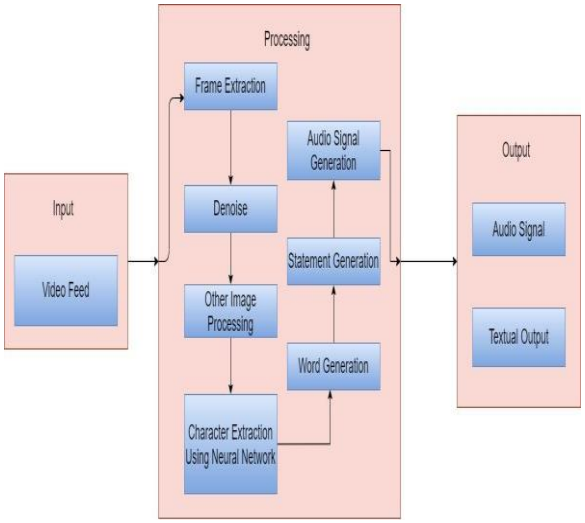


*Fig 3- Data Flow Diagram of Sign Language Recognition*

## 9. USE CASE DIAGRAM

When it comes about interaction with the system then use case plays an important role in establishing relationships between users and its different use cases.

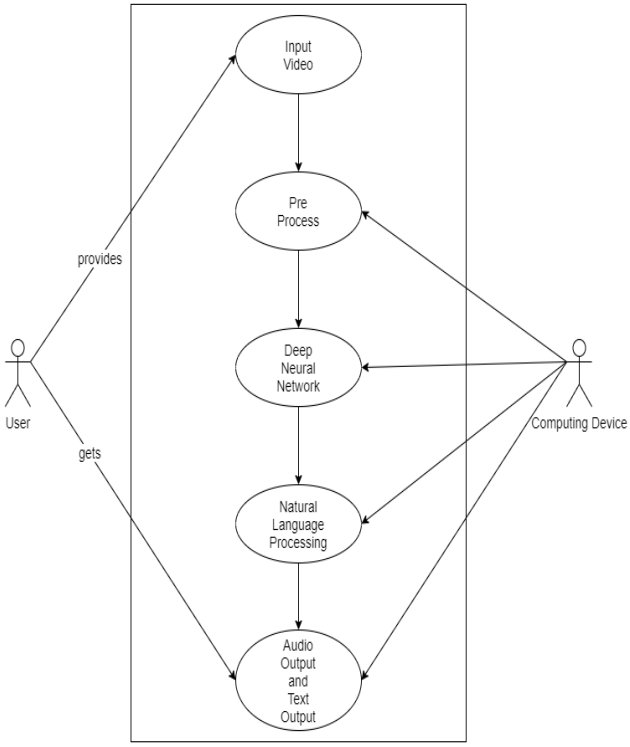


*Fig 4- Use Case Diagram of Sign Language Recognition*

## 10. CONCLUSION

Our goal is to develop an optimized system that will convert video of daily frequently used full sentences of American Sign Language(ASL) gesture into text and then convert it into audio. Various Machine Learning models are being used to get the most accurate result and to optimize the model in which we can detect results as quickly as possible. This project will focus on the development of the model and its deployment so that the results can be interpreted in the simplest manner possible for a larger audience to use it.

## 11. REFERENCES

[1] Machine learning model for sign language interpretation using webcam images by Kanchan Dabre and Surekha Dhole: https://ieeexplore.ieee.org/document/6839279
[2] Deaf Talk Using 3D Animated Sign Language IEEE by Mateen Ahmed, Mujtaba Idrees, Zain ul Abideen, Rafia Mumtaz and Sana Khalique:
https://ieeexplore.ieee.org/document/7556002?denied=
[3] Real-time American Sign Language Recognition with Convolutional Neural Networks by Brandon Garcia and Sigberto Alarcon Viesca:
https://www.semanticscholar.org/paper/Real-time-American-Sign-Language-Recognition-with-Garcia/07a152c14004082a393caa31a6052578570a8b95?p2df
[4] Mask R-CNN by Kaiming He, Georgia Gkioxari, Piotr Dollar and Ross Girshick:
https://ieeexplore.ieee.org/document/8237584
[5] Sign Language Recognition using 3D Convolutional Neural Networks by Jie Huang, Wengang Zhou, Houqiang Li and Weiping Li:
https://doi.org/10.1109/ICME.2015.7177428
[6] A Real-Time System for Recognition of American Sign Language using Deep Learning by Murat Taskiran, Mehmet Kıllıoğlu, and Nihan Kahraman:
https://ieeexplore.ieee.org/document/8441304
[7] Recent Advances of Deep Learning for Sign Language Recognition by Lihong Zheng, Bin Liang and Ailian Jiang:
https://doi.org/10.1109/DICTA.2017.8227483
[8] American Sign Language Recognition System-An Optimal Approach by Shivashankara S and Srinath S:
https://www.researchgate.net/publication/326972551_American_Sign_Language_Recognition_System_An_Optimal_Approach
[9] Sign Language Interpreter using Image Processing and Machine Learning by Omkar Vedak, Prasad Zavre, Abhijeet Todkar, Manoj Patil :
https://www.irjet.net/archives/V6/i4/IRJET-V6I4413.pdf
[10] American sign language recognition using Convolutional Neural Network by Sarfaraz Masood, Harish Chandra Thuwal , Adhyan Srivastava :
https://www.researchgate.net/publication/320703517_American_Sign_Language_Character_Recognition_Using_Convolution_Neural_Network
[11] Recognizing American Sign Language Gestures from within Continuous Videos by Yuancheng Ye , Yingli Tian , Matt Huenerfauth and Jingya Liu :
https://openaccess.thecvf.com/content_cvpr_2018_workshops/papers/w41/Ye_Recognizing_American_Sign_CVPR_2018_paper.pdf
[12] Sign Language Recognition using ConvolutionalNeural Networks by Lionel Pigou, Sander Dieleman, Pieter-Jan Kindermans and Benjamin Schrauwen:
https://core.ac.uk/reader/191309220
[13] Using Deep Convolutional Networks for Gesture Recognition in American Sign Language by Vivek Bheda and N. Dianna Radpour:
https://arxiv.org/ftp/arxiv/papers/1710/1710.06836.pdf
[14] Video-based isolated hand sign language recognition using a deep cascaded model by Razieh Rastgoo, Kourosh Kiani and Sergio Escalera:
https://link.springer.com/article/10.1007%2Fs11042-020-09048-5
[15] Parameters of ASL
https://www.mtsac.edu/llc/passportrewards/languagepartners/5ParametersofASL.pdf