Real time Sign language converter using machine learning.

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Abstract-Sign language is the only tool of communication for a person who is not able to speak andhear anything. Sign language is a boon for physically challenged people to express their thoughts and emotion. In this system, a novel scheme of sign language recognition has been proposed for identifying the alphabet and gestures in sign language. With the help of computer vision and neural networks, we can detect the signs and give the respective text output. We have developed a system to make the conversation easy between especially abled people and normal peoples.

Index Terms - Sign language, Neural Network, Computer vision

I. INTRODUCTION

Establishing communication or interaction with Deaf and Mute people is of utter importance nowadays. These people interact through hand gestures or signs. Gestures are the physical action form performed by a person to convey some meaningful message to the other person. Gestures are a powerful means of communication among humans. Gesturing is so deeply rooted in our communication that people often continue gesturing when speaking on the telephone. There are various signs which express complex meanings and recognizing them is a challenging task for people who have no understanding of that language. It becomes difficult finding a well experienced and educated translator for sign language every time and everywhere. The remarkable ability of human vision is gesture recognition; it is noticeable mainly in deaf people when they are communicating with each other via sign language and with hearing people as well. In this developed system, we take up one of the social challenges to give this set of masses a permanent solution for communicating with normal human beings. Sign language is categorized in accordance with regions like Indian, American, Chinese, Arabic, and so on, and research on hand gesture recognition, pattern recognition, and image processing have been carried out by supposed countries as well to improve the applications and bring them to the best levels.

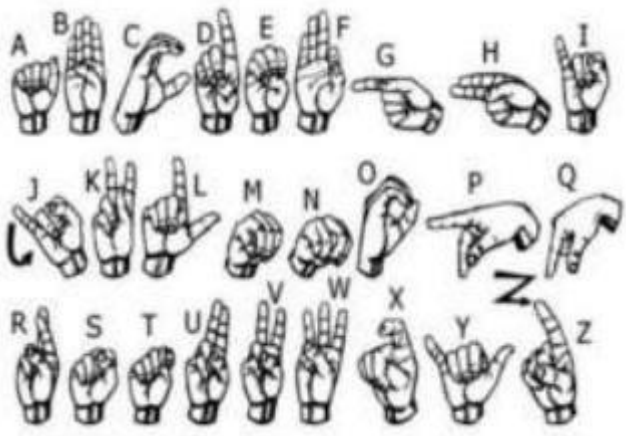


FIG NO 1. SIGN LANGUAGE ALPHABET SIGNS

1.1 SIGN LANGUAGE

Sign language is manual communication commonly used by people who are deaf. Sign language is not universal; people who are deaf from different countries speak different sign languages. The gestures or symbols in sign language are organized in a linguistic way. Each individual gesture is called a sign. In the western world, the first studies dedicated to signing languages date from the 17th century. In 1620, in Spain, the priest Juan Pablo Bonnet published a text about teaching deaf people to speak, using gestures as a tool. The language of signs created by Bonet was used by Abbé Charles- Michel de l-Épée, to create a fingerspelling alphabet in the 18th century. This alphabet has changed very little since then and is used with sign languages in many countries. It's the main form of communication for the Deaf and Hard-of-Hearing community, but sign language can be useful for other groups of people as well.

II. PROBLEM STATEMENT

To interact the normal people with the D people a language barrier is created as the sign language structure can be different from the normal text. So, for the interaction, they depend on vision-based communication. So, if there is a common interface available that can convert sign language to text then it will be easily understood by people.

The main is to develop a user-friendly human-computer interface. Where the computer can understand human sigh language. There are various sign languages all over the world. Namely, American sign language(asl), French sign language (FSL), British sign language (BSL), Indian signlanguage, and Japanese sign language, and the work has been done on other languages all around the world.

III. LITERATURE SURVEY

Almost 72 million of the world's population is deaf/mute people as per the report published by the World Federation of the Deaf [1]. Sign language is a fundamental human right for deaf people, from which it is possible to achieve all other human rights [2]. There are over 240 sign languages for spoken languages around the world [3]. There are a lot of glove-based devices available in the market for different purposes. One of the most important features of glove-based devices is to provide communication for mute people through the identification of gestures and converting them into real- time. Recognition, generation, and translation of sign language is a research area with a high potential impact. Sign language processing would reduce the barrier for mute people while communicating [4]. Google has introduced a wristband that identifies the gesture shown by the user which is later approved as only theoretically possible [5]. TOSHIBA has also developed an android that helps in the identification of sign language [6]. In the existing systems, the device just converts the sign language to its corresponding text or speech. There is no provision for storing the data or prediction of gestures. One of the best algorithms for prediction is the Particle swarm optimization – backpropagation (PSO-BP). This algorithm is used in the prediction of performance in education management [7]. It is also used in the prediction of the stay of a patient in a hospital [8]. The PSO- BP algorithm can balance the relationship between energy and economic growth [9].

1. A Survey of Hand Gesture Recognition

The Methods in Sign Language Recognition system is a Sign Language Recognition (SLR) system, which is required to recognize sign languages, it has been widely studied for years. The studies are based on various input sensors, gesture segmentation, extraction of features, and classification methods. So, this paper aims to analyse and compare the methods employed in the SLR systems, and classic captions methods that have been used and suggests the most promising method for future research. Due to recent advancements in classification methods, many of the recent proposed works mainly contribute to the classification methods, such as the hybrid method and Deep Learning. This paper focuses particularly on the classification methods used in prior Sign Language Recognition systems. Based on our project review, HMM-based approaches have been explored extensively in prior research, including their modifications.[13]

2. Communication between Deaf Dumb People and Normal People

Chat applications have become a powerful media in today's world that assist people to communicate in different languages with each other and help people to elaborate. There are lots of chat applications that are used by different people in different languages but there is not many chats application that has facilitated communication with sign languages. This system has included four main components text messages are converted to sign messages, voice messages are converted to sign messages, sign messages are converted to text messages, and sign messages are converted to voice messages. Google voice recognition API has been used to develop speech character recognition for voice messages.[13]

3. Intelligent Sign Language Recognition Using Image Processing

Computer recognition of sign language is an important research problem for enabling communication with hearing-impaired people. This project introduces an efficient and fast algorithm for the identification of the number of fingers opened in a gesture representing an alphabet of the Binary Sign Language. The system does not require the hand to be perfectly aligned with the camera. The project uses an image processing system to identify, especially English alphabetic sign language used by deaf people to communicate. The idea consisted of designing and building up an intelligent system using image processing, machine learning, and artificial intelligence concepts to take visual inputs of sign language's hand gestures and generate the easily recognizable form of outputs. Hence the objective of this project is to develop an intelligent system that can act as a translator between sign language and spoken language dynamically and can make communication between people with hearing impairment and normal people both effective and efficient.[13]

IV. METHODOLOGY

Four major steps are proposed algorithm consisted, the names are Image acquisition, featureextraction, orientation detection, and gesture recognition.

A system is a vision-based approach. All the actions are represented by the sign so it can eliminatethe problem of using any artificial device for communication.

1 DATA SET GENERATION

For the project we tried to find already made datasets, but we couldn't find dataset in the form of raw images that matched our requirements. All we could find were the datasets in the form of RGB values.

Hence, we decided to create our own data set. Steps we followed to create our data set are as follows. The process of creating a dataset involves three important steps:

1. Data Acquisition
2. Data Cleaning
3. Data Labelling

2 GESTURE CLASSIFICATION

The approach which we used for this system is: Our approach uses two layers of algorithm to predictthe final symbol of the user.

ALGORITHM LAYER 1:

1. Apply Gaussian blur filter and threshold to the frame taken with OpenCV to get the processed image after feature extraction.

2. This processed image is passed to the CNN model for prediction and if a letter is detected for more than 50 frames then the letter is printed and taken into consideration for forming the word.

3. Space between the words are considered using the blank symbol.

ALGORITHM LAYER 2:

1. We detect various sets of symbols which show similar results on getting detected.

2. We then classify between those sets using classifiers made for those sets only.

3 GESTURE RECOGNITION

Using the training dataset, the Algorithm classifies the gesture and then after comparing with thetraining data the gesture is recognized properly.

4 TEXT/SPEECH OUTPUT

Next step is the output in the form of text, sentences, words, or audio message.

V. SYSTEM ARCHITECTURE

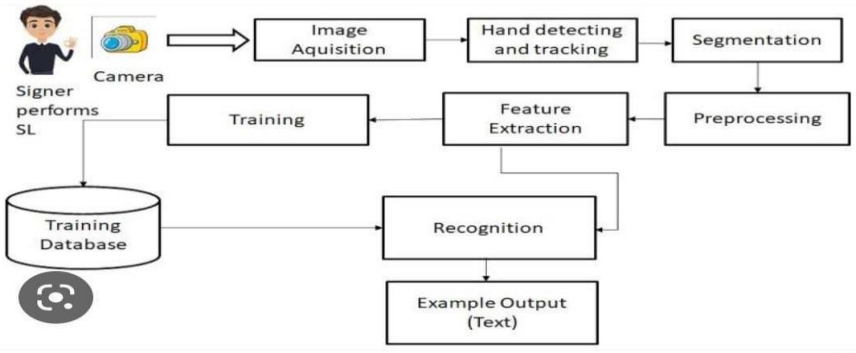


Fig No 2 Gesture recognition and text output

In Fig No 2, As shown in the above figure training data is collected, with that training data the handgestures are recognized based on the training data and after extracting the data about the sign the output is generated in the form of the text.

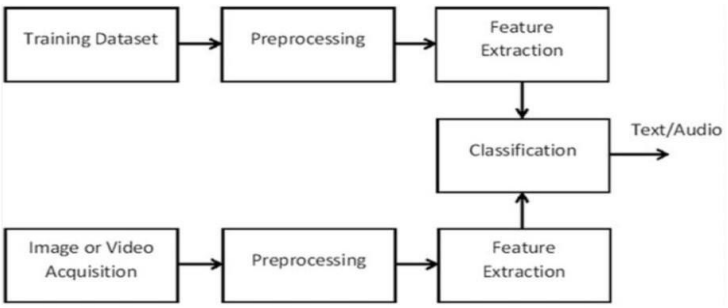
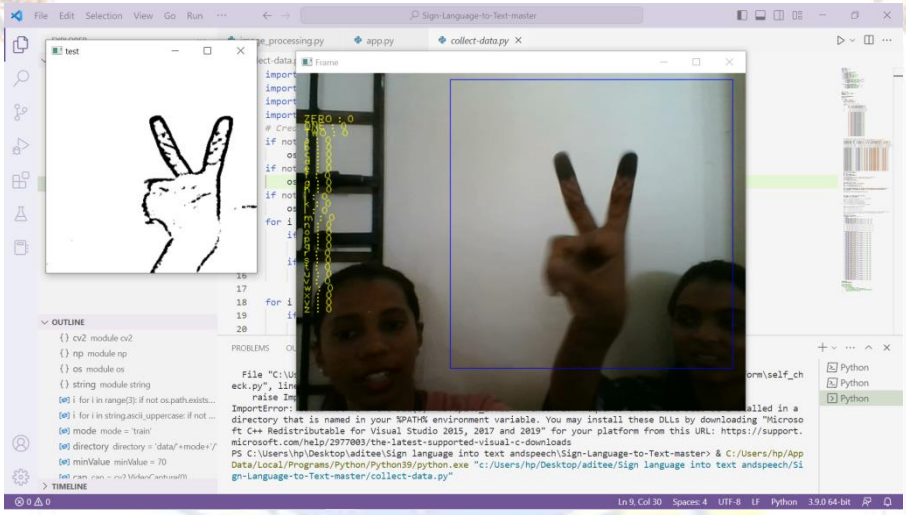
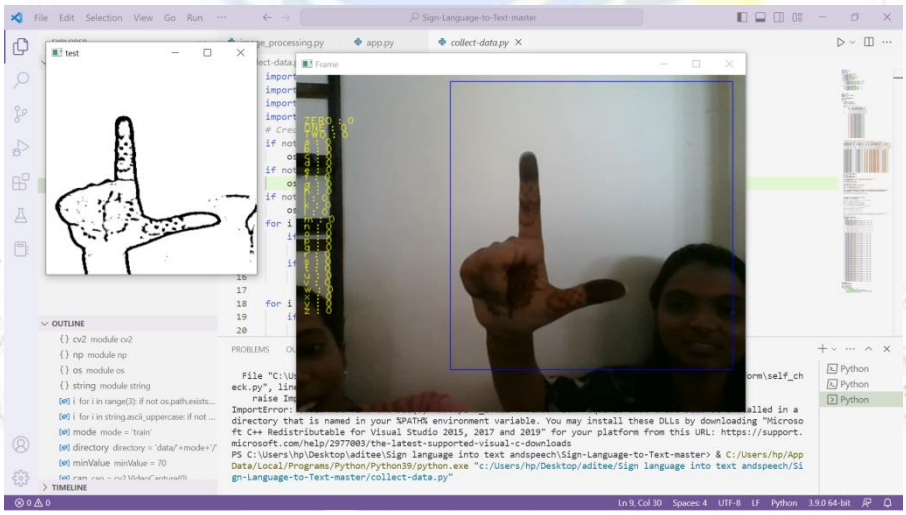


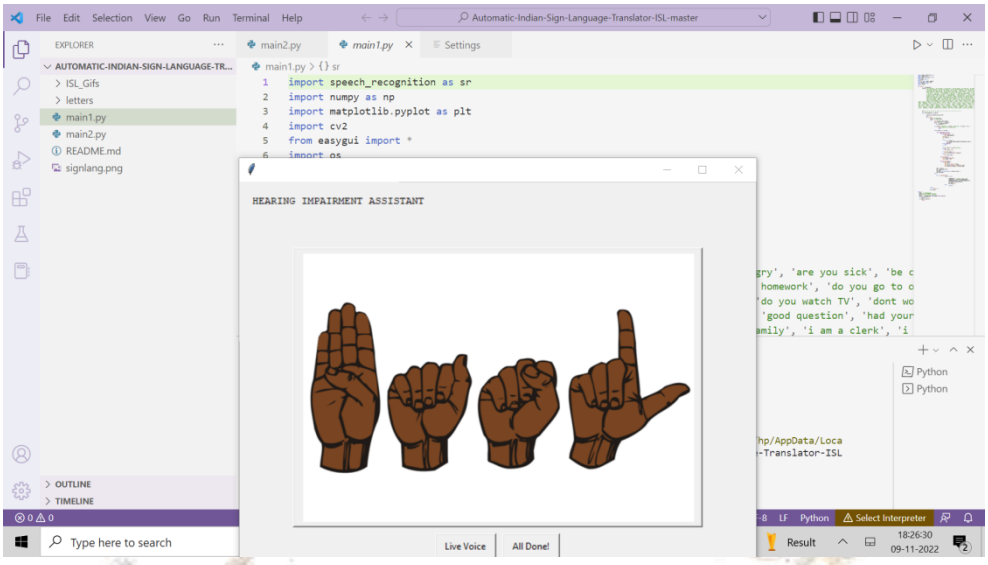
Fig No 3 Output in the form of text/speech

In the above Fig No 3 the gesture is recognized and processed and extracted with thetraining dataset and after the classification the output is generated in the form of the text or thespeech.

VI. RESULT







VII. CONCLUSION

This Developed System is a Simple solution to the problem faced by especially abled people to communicate with everyone without any external help. Our System works vice versa so the able people will be able to communicate with those, especially abled people easily.

We used the CNN algorithm in our system to solve the problem of computer vision with an extremely high degree of accuracy. The Developed System will continue to other sign languages by building the corresponding dataset and training the CNN.

Sign languages are spoken more in context rather than as finger spelling languages thus the system can solve a subset of the Sign Language translation problem. The main objective that has been achieved, which is the need for an interpreter, has been eliminated.

The proposed system can be used to recognize the sign language letters, and then it can be further extended to recognize the gestures of facial expressions also. To increase reliability, it will be more appropriate to display the sentences rather than the words as the more appropriate translation of language. The scope of the different sign languages can be increased. More training data can be added to detect the accuracy of the letter. This project can be further extended to convert the signs to speech. We also proposed to develop this system and vice versa, conversion of text and speech to sign language.

VIII. REFERENCES

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