Sign Language to Speech for Dumb and Deaf People

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Abstract— Voice and Language is the main thing for human to communicate with each other. Due to hearing ability we can understand thoughts of each other. Even nowadays we can give commands using voice recognition. But what if one absolutely cannot hear anything and eventually cannot speak. So, The Sign Language is used as main communicating tool for hearing impaired and mute people, and it also to ensure an independent life for them, the automatic interpretation of sign language is an extensive research area. With the use of technology such as image processing and artificial intelligence, many techniques and algorithms have been developed in this area. Every sign language recognition system is trained for recognizing the signs and converting them into respective speech. The proposed system aims to provide speech to speechless, in this paper the double handed Indian Sign Language is captured as a series of images and it's processed with the help of Python and then it's converted to speech and text.

Keywords: Sign Language Recognition, Artificial Neural Networks, Assistive Technology, Translator, Image Processing, Gesture Recognition

I. INTRODUCTION

Sign languages are vivid on wide and world level. There are multiple sign languages in world which are regular in use that are ASL (American Sign Language) ISL (Indian Sign Language). These languages are Built and Developed with lots of work and practical testing with intention of feasibility to the deaf and dumb persons. Any language is created with its word and its meaning. Sign Language is created as "Sign" and "Action of That Sign". Because here we are not able to make them understand meaning of sign by writing word. As they are deaf and cannot listen from birth so we cannot teach them words.

A. Problem Statement

A random person if visited to deaf person and if deaf person is in problem and trying to explain then it is very difficult to understand what exactly he is trying to say. Delay in detecting his Sign Language can turn into critical problem for that deaf person. These kinds of people cannot spend normal life. They face communication issues at every point. Also, they get boundaries and limitations to their dreams and professional aims. Hence, they get demotivated and Inferiority Complex.

B. Objective

Objective is to give them ability to be expressive in ideas and thoughts. They can get helped in increasing their motivation and confidence and it will help them to think positively and to conquer that physical disability. To develop system with using latest technologies and tools we are keeping objective to overcome from this global level problem.

C. Motivation

We are motivated with aim to use new technologies for better humanity. We found Machine learning like technologies can be used for conquering the backwardness occurred because of this physical disability.

D. Scope

This system will definitely can become step into innovation of this global level problem solution. Our system can be Prototype and Proof of Concept for global level solution. This system can be used by Deaf and Deaf persons and also normal person can have this system with them and deaf person can perform sign in from of camera and sign can be converted to text or speech.

II. LITERATURE SURVEY

A. Crawling and Classification Strategies for Generating Multi language corpus for sign language

Author- Frank M. Shipman and Caio D.D. Monteiro
Their work into the crawling and classification of sign language videos sets the stage for more human-centered activities exploring instantiation and community engagement.

B. Dynamic Tool for American Sign Language Finger Spelling Interpreter

Author- Prateek S.G., Jagadeesh J., Siddarth R.
Their approach first converts the videos into frames and then pre-processes the frames to convert them into greyscale images. Then the Convolutional Neural Network (CNN) classifier is used for building the classification model which classifies the frames into 26 different classes representing 26 English alphabets.

C. Real-Time Recognition of Indian Sign Language

Author- H Muthu Mariappan and V Gomathi
For recognizing the signs, the Regions of Interest (ROI) are identified and tracked using the skin segmentation feature of OpenCV. The training and prediction of hand gestures are performed by applying fuzzy c-means clustering machine learning algorithm.

III. EXISTING SYSTEM

In recent years, algorithms such as Hidden Markov model (HMM), Back Propagation (BP) neural network and Support Vector Machine (SVM) are applied to sign language recognition that have obtained a certain effect. At present, deep learning is employed to sign language recognition, which has greatly improved the sign language recognition rate. Many Sign Language recognition systems were developed by researchers but there is still a need for accurate and more effective way to recognize the signs. Currently the systems proposed by earlier researchers are

based on the conversion of an action-based verb to an equivalent sign. These systems have the restriction of handling maximum number of action verbs in the specific language. The research aims to develop a sign language recognition system for the English phonemes.
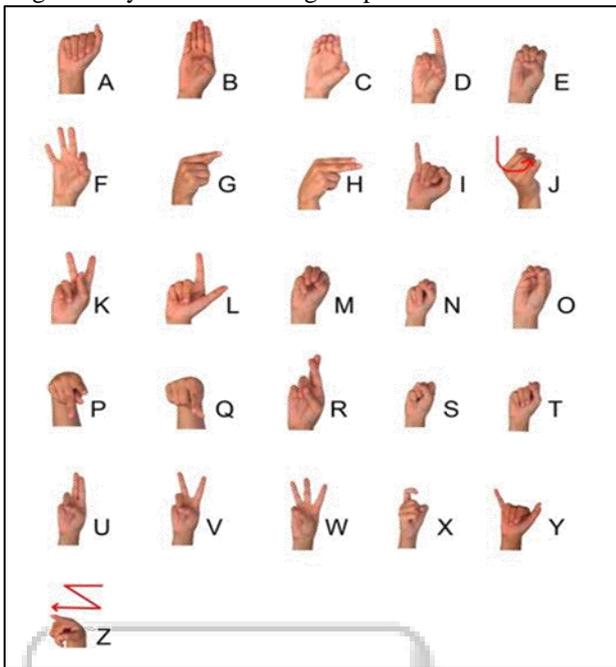

Fig. 1: Sign Language Alphabets

IV. PROPOSED SYSTEM

We are proposing a system that will use machine learning algorithm i.e. CNN Convolutional Neural Network. Our planned model will be trained with around 100-500 images of and with increasing epoch in order to increase accuracy. The reason we are using CNN is it has multiple layers hence it will help into training model with easy manner. We will sue Open Computer Vision Technology simultaneously to interact with camera, to take live input from camera. We will set and define different signs with images and that images will be trained with algorithm. Person will have to perform sign in front of camera. After taking live input from camera the sign will be recognized. Recognized sign will give text output and it will be translated to audio sound. So, system will work as Sign to Speech.

V. IMAGE CLASSIFICATION

Convolutional neural networks (CNN) have been widely used in automatic image classification systems. In most cases, features from the top layer of the CNN are utilized for classification; however, those features may not contain enough useful information to predict an image correctly. In some cases, features from the lower layer carry more discriminative power than those from the top. Therefore, applying features from a specific layer only to classification seems to be a process that does not utilize learned CNN's potential discriminate power to its full extent. This inherent property leads to the need for fusion of features from multiple layers. To address this problem, we propose a method of combining features from multiple layers in given CNN models. Moreover, already learned CNN models with

training images are reused to extract features from multiple layers. The proposed fusion method is evaluated according to image classification benchmark data sets, CIFAR-10, NORB, and SVHN. In all cases, we show that the proposed method improves the reported performances of the existing models by 0.38%, 3.22% and 0.13%, respectively.
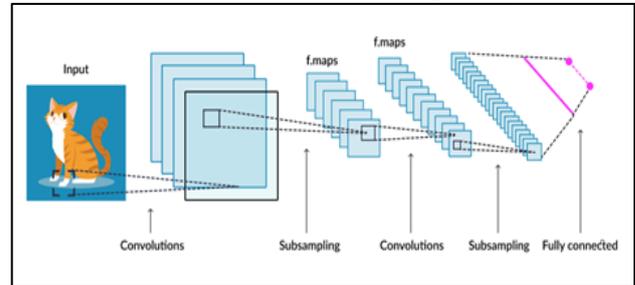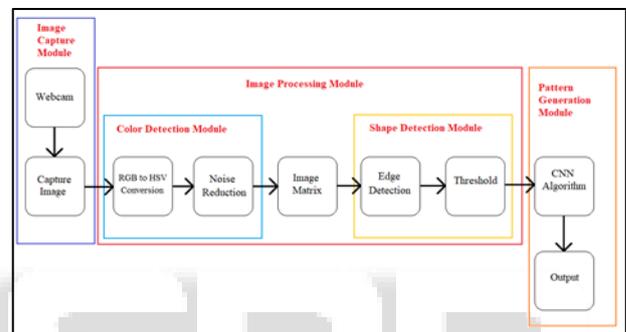

Fig. 2: CNN Classifier

VI. SYSTEM ARCHITECTURE

Fig. 3: System Architecture

A. List of Modules/Functionalities

1) Image Capture Module
2) Image Processing Module
3) Edge Detection Module
4) Shape Detection Module
5) Pattern Recognition Module
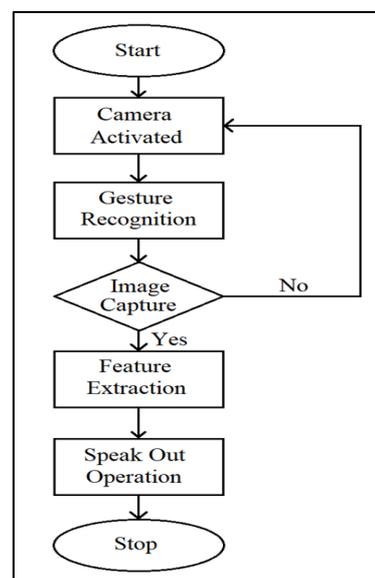6) Speech Conversion Module

VII. FLOW CHART

Fig. 4: Flow Chart

VIII. CONCLUSION

A Neural Network-based method for automatically recognizing the finger spelling in Indian sign language is developed in this project. The signs are identified by the features extracted from the hand shapes. We used skin color-based segmentation for extracting the hand region from the image. A new shape feature based on the distance transform of the image is proposed in this work. The features extracted from the sign image are used to train a feed forward neural network that recognizes the sign. The method is implemented completely by utilizing digital image processing techniques so the user does not have to wear any special hardware device or gloves to get the features of the hand shape. Our proposed method has low computational complexity and very high accuracy when compared to the existing methods.

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