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Sign Language Converter & Recognition

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Abstract: Sign language is the only way the speech and hearing impaired (i.e dumb and deaf) people can communicate. The main difficulty of this way of communication is normal people who cannot understand sign language can't communicate with these people or vice versa. Our project aims to bridge the gap between the speech and hearing-impaired people and the normal people. An individual's ability to communicate using speech and hearing is affected by Speech impairment disability. Sign language is other media of communication for people who are affected. The essential idea of this project is to make a system using which dumb people can importantly interact with all other people using their normal gestures. The system does not need the background to be perfectly black. It works on any background. The project requires image processing system to identify, mainly English alphabetic sign language used by the deaf people to communicate and converts them into text so that normal people can understand efficiently. To build a vision-based application which offers sign language translation to text thus aiding communication between signers and non- signers is the main objective of project. The proposed model takes video sequences of signers and extracts temporal and spatial features from them. We then use a CNN (Convolutional Neural Network) for recognizing spatial features.

Keywords: Machine learning, Computer vision, Sign language, Convolutional Neural Networks (CNN), Sign recognition.

I. INTRODUCTION

American Sign Language (ASL) substantially facilitates communication in the deaf community. However, there are only ~250,000-500,000 speakers which significantly limits the number of people that they can easily communicate with the alternative of written communication is cumbersome, impersonal and even impractical when an emergency occurs. In ASL recognition system that uses Convolution Neural Networks (CNN) in real time to translate a video of a user's ASL signs into text which reduce the obstacle of communication and permit dynamic communication. Inability to speak is measured to be true disability. People with this disability use diverse modes to communicate with others. There are number of methods presented for their communication one such common method of communication is sign language. Sign language application is useful for deaf people, as they will be able to communicate easily with even those who don't understand sign language.

II. OBJECTIVE

- To interface camera to system for image capture
- To do CNN (Machine learning) based image classification to recognize sign in image
- To convert meaning text of detected sign into speech

To form communication simplex between deaf and dumb people by introducing Computer in communication path so that sign language can be automatically captured, acknowledged, translated to text.
Our software is designed especially for people who are mute but all other users can use it. The main purpose is to allow the user to use sign language in front of its Intel camera and then the application is recognizing the gesture. Every move acknowledged is translate and send to the different user Secondly, for people who are blind or partially-sighted, once they received the translation of the movement, the matter is also read. Then we need to allow more than two users to speak jointly. Our endmost purpose is to allow the self-learning on our application of new signs.

III. EXISTING SYSTEM

Initially, for the implementation of the glove, a glove of latex (surgical glove) is used. It being tight, serves the purpose of proper alignment of the sensors on the fingers. Gestures are captured from the sensor glove. Each finger is associated with one flex sensor. From this system we have achieved communication with the help of finger gestures. It exhibits a fluent communication mode between normal and deaf/dumb people but it needs additional hardware which increases cost of the project. This drawback is overcome in our proposed system.

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IV. PROPOSED SYSTEM

The camera is used to record the hand gestures and then the videos are pre-processed to frame sequences which are fed individually to the CNN for two possible outputs. The global pool layer gives us a 2048 sized vector, which possibly allows for more features to be analysed by the testing, every input picture will pass it through a order of convolution layers with filters (Kernels), Pooling, fully connected layers (FC) and apply Soft max function to sort an object with probabilistic values between 0 and 1. The above figure is a complete flow of CNN to process an input sign image and classifies the objects based on values.

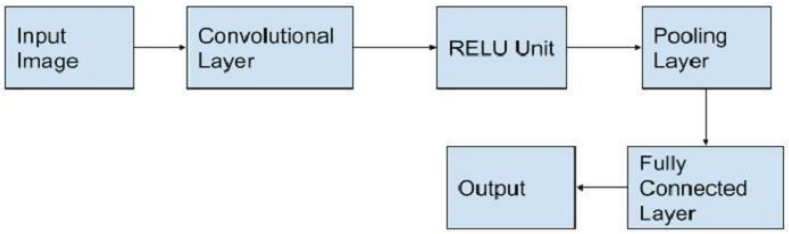

Fig.1 CNN Architecture

CNN Algorithm:

1. Give an input image into convolution layer.
2. select parameters, apply filters with strides, padding if required. Do convolution on the image and apply RELU activation to the matrix.
3. Carry out pooling to reduce dimensionality size
4. Add as many convolutional layers until satisfied
5. Flatten the result and feed into a fully connected layer 6. Result of the class using an activation function (Logistic Regression with cost functions) and classifies images.

The CNN model extracted temporal features from the frames which were used further to predict gestures based on sequence of frames. The CNN model used was Inception [6], which was a model developed by Google for image recognition as is widely regarded as the most image recognition neural network which exists right now. We use two different approaches to classification: -Using the predictions from the Softax layer and -Using the output of the global pool layer. In neural network, Convolutional neural network (ConvNets or CNNs) is one of the main categories to do images identification, images categorize. Objects discovery, recognition faces etc., are some of the areas where CNNs are widely used.

CNN image classifications take an input image, process it and sort out it under certain category (Eg. Hand). Computer sees an input image as array of pixels and it depends on the picture resolution. Based on the picture resolution, it will see h x w x d(h = Height, w = Width, d = Dimension). Eg., An picture of 6 x 6 x 3 array of matrix of RGB (3 refers to RGB values) and an picture of 4 x 4 x 1 array of matrix of grayscale picture.

There are 3 major constraints for the project. They are as follows:

1) Image input: This module is used to take image from external and provide that image to image processing unit. The image processing unit consist basic segmentation and morphological operation to improve image features.
2) Machine learning (CNN)image classification: This module is used to detect and classify image of sign.CNN machine learning algorithm is used to detection and classification of image.
3) Text to speech: This module is used to convert classified sign into text .The resultant text will convert into speech.

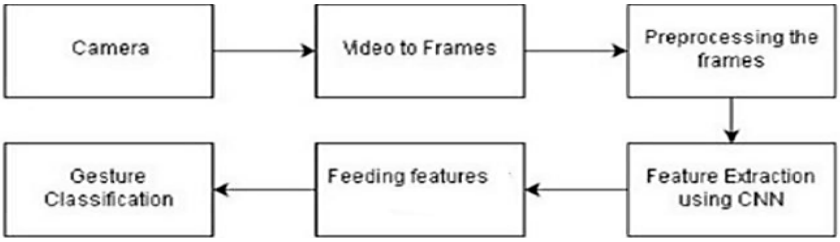

Fig.3 Architecture Diagram

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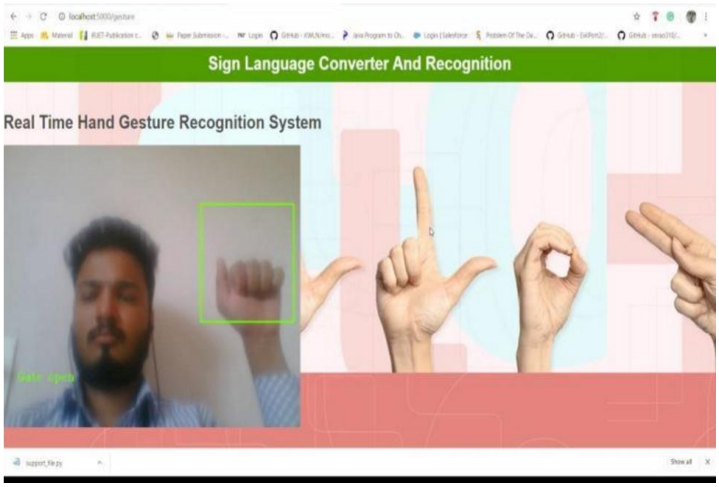
American Sign Language is also referred to as ASL. A real-time sign language translator is required for facilitating communication between the deaf community and the general public.

V. RESULT AND DISCUSSION



Results shows that to make communication simpler between deaf and dumb people by Computer in communication path so that sign language can be automatically captured, recognized, translated to text. This system recognise different hand gesture and successfully detect meaning of that hand gesture very well and accurate convert it into speech .so this system is effectively capture recognize and predicate whatever people want to speak help dumb and deaf people to efficiently communicate in society.

VI. CONCLUSION

This project deals with the application of Convolution Neural Network for recognizing the hand gestures. One of the essential applications of hand gesture recognition is to identify the sign language which is a lively tool of communication for physically impaired, deaf and dumb people. This application will help to bridge the gap between normal and deaf/dumb people.

From the outcome obtained above we can conclude that Convolution Neural Network provides a remarkable accuracy in identifying the sign language characters including alphabets and numerals. This piece of work can be further extended to building a real time application which can determine the sign language and including words, sentences to recognize instead of just characters or single word.

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