

Sign Language Recognition using Convolutional Neural Network

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Abstract—Through communication human understand thoughts, feelings & needs of other people. Sign language is unavoidable for people with hearing impairment so, sign language is intermediate medium for communication between deaf and normal people. Sign language system is powerful and helpful tools for people with hearing and speech disability to put their opinions. It is not confused for someone who has not learn it.

In this survey paper, we develop sign language recognition system with the help of Indian sign language. In this project, user must be able to capture images of palm signs using web camera, system conclude and display the name of capture images. We make the use of convolutional neural networks for training & classify the images. First create a database with different background and different image preprocessing techniques are use to make the dataset ready for feature extraction process. Testing is performed to find accuracy and efficiency. We are using CNN in this model to convert the Indian Sign Language to text because CNN helps to increase the accuracy of the system.

Index Terms— Sign Language, Hearing Disability, Convolutional Neural Network, Machine Learning, Indian Sign Language, Hand Gesture.

I. INTRODUCTION

In our daily life, humans communicate with each other using words and gesture but for the deaf people or people who are hard of hearing sign language is the way for communication. By considering this differently abled people and new innovative Technologies we have built the sign language recognition system. This will open different new opportunities for a sign language users to communicate friendly and efficiently and showcase their skills to global in easy way. This survey paper aims to cover most recent technologies to add advanced features in basic existed system in this project. We have used concept of image detection, feature extraction and text recognition and used CNN algorithm. This model will help the people to overcome the challenges. They faced while communicating with hearing people and human computer interaction. This survey paper covers the existing sign language recognition system designed and methods and techniques used in this project.

In section 2 discussed about data sets used in this model. section 3 describes the methods and approaches for the sign language recognition system. and finally Conclusion and future addition or a directions in this area is discussed in last section.

II. RELATED WORK

Recognizing hand gestures is a crucial component of for the last two decades of research. Scientists have done much study and experimented with a range of methods for recognizing gestures.

From reference [1] For the purpose of recognizing the ISL symbols, Arun C.S, Geethu Nath. created a system employing the ARM CORTEX A8 CPU. Jarvis algorithm is used by the system to identify numbers, while template matching algorithm is used to identify alphabets.

From reference [2] Karen Das and Joyeeta Singha provided novel method for identifying ISL alphabets. A approach based on eigenvectors is utilised to extract features, and a strategy based on eigenvalues weighted Euclidean distance is used to classify 26 different ISL alphabets.

From reference [3] Juilee Paranjpe, Pranali Loke and Sayali Bhabal, these people have proposed a sign language converter by the use of an synthetic neural community on MATLAB. In this, they have not applied however handiest proposed a technique to create an android utility for signal language converter.

From reference [4] They have selected the palm gesture reputation characteristic to apprehend the signs and feature transformed those to herbal language. They have proposed system making use of the HSV version for hand monitoring and community. With the help of an android utility, they have captured the pics and uses them as an enter of their neural community. The

Palm gestures matches with its respective palm gestures on MATLAB and the final transformed textual content is dispatched again to the system, making it a machine so that it will resource the human beings unknown to signallanguage.

From reference [5] We have stated papers that have transformed signal languages the usage of one of a kind algorithms. One of those papers is with the help of Tanvir Hossain Sajib, Muttaki Hasan, this people used SVM classifier and feature used Histogram of Oriented Gradients for function extraction of phrases with inside the Bengali signal language(BSL). In this, they have transformed the expressions input into their respective audio outputs. They first preprocessed the snapshots the usage of binary thresholding, after which segmented the snap shots with the aid of using cropping the palm gesture with the help of the OpenCV library. The subsequent process taken with the aid of using them turned into to teach and check the classifier with the trying out set of sixty two of the 300 snap shots. lastly, the result from the classifier is transformed into audio with the assist of the Text-to-speech(TTS) engine with inside the library of python. After execution this model gives more than 86% accuracy.

From reference[6] A Indian Sign Language recognition framework was built by Pei Xu al. the achieved accuracy is of 99.6% on 14 gestures. This included preprocessing of the input using Convolutional filters, morphological transformations and gaussian blurring. After preprocessing, the resultant images were assigned to a Convolutional NN to distinguish between Kalman estimator and different motions was used to move the cursor in the case it finds the signals.

From reference [7] Sruthi P and Lijiya in their paper, they have proposed a sign primarily based totally ISL reputation machine.. They have used imaginative and prescient primarily based totally reputation machine in which they first method the photo with a pores andskin color segmentation set of rules accompanied through the biggest related issue set of rules for hand place segmentation to build the dataset. They educate the statistics with the help of CNN model. By the use of 26 ISL alphabets, they have got a education accuracy of 99.92% and 97.62% of validation accuracy .

From reference [8] Noor Tubaiz proposes sequential data classification using Modified k-Nearest Neighbor(KNN) approach. Palm movements were detected by data gloves. Raw data were enhanced with the help of window-based features, which are calculated from previous raw feature vectors and future raw feature vectors. Depending on the existing system, the recommender model was developed with new techniques to identify from Indian Sign Language(ISL). Till now it is known, the first attempt to create a system that provides ISL gesture identification without using a depth-based web camera. Semantic segmentation method completely removes the need for to use depth-based sensing. Our models perform well and good in almost all conditions and palms of all sizes.

III. METHODOLOGY

Today's evolved technology has strength to help the deaf and dumb people. We build a system that can recognise Indian signlanguage using CNN. The sign language user can use webcamera and the identified alphabets and numbers can be displayed on the screen. This system uses tensorflow and keras library. We have created the dataset using webcam and fetched images using OpenCV library.

The proposed model uses Indian Sign Language dataset to recognize the signs made by hand gestures.

A. Dataset

The Indian sign language dataset contains signs for A to Z alphabets and numbers from 1 to 9. This dataset is used to train the proposed model. We have used OpenCV library to develop dataset.

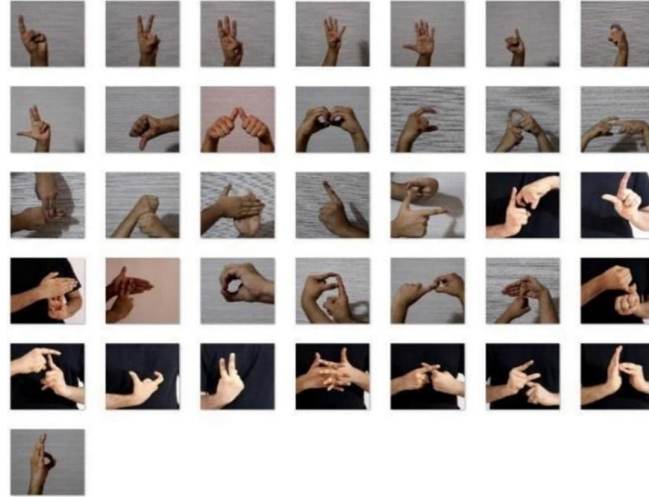


Fig 1: Indian Sign Language Dataset

B. Preprocessing

The captured image is in RGB colour format. In this step image processing takes place that is transformation of RGB image to grayscale i.e, 3D to 1D. The 1D format is the grayscale image. We have used average method for this transformation.

$$GREY = \frac{R+G+B}{3}$$

This method takes 33% of blue 33% of red and 33% of green. This system works good and satisfies the requirements.

C. Proposed System

Hand segmentation is an important step in the model. First capture hand image using webcam. To get an accurate model large data set is needed. CNN is used for training and testing.

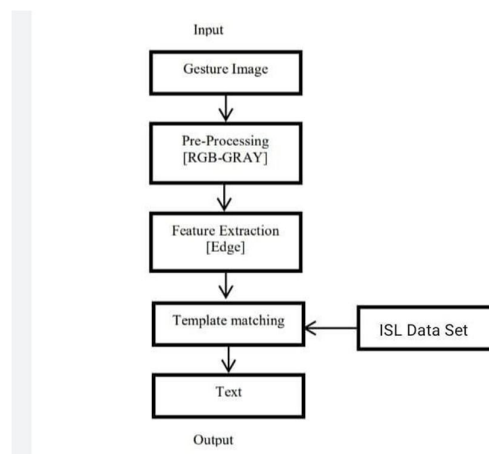


Fig2: Schematic diagram for sign language recognition

D. Training

We have used tensorflow library with CNN algorithm for training and classification purpose. CNN adds filters to detect certain features of the image. the working of CNN depends on the types of filters applied.

Particularly CNN used for image classification. CNN provides better solutions. CNN is little bit same as neural network. Main building blocks of CNN are convolutional layer, pooling layer and fully connected layer. Where Convolutional layer extracts feature from input images by convolving filters. Filter is just small kernel that learned. Pooling layer reduces the input dimensionality. Pooling layer operates each feature map independently. Fully connected layer are similar to multilayer which will have preceptron. They have whole connection with all neurons in the subsequent layer.

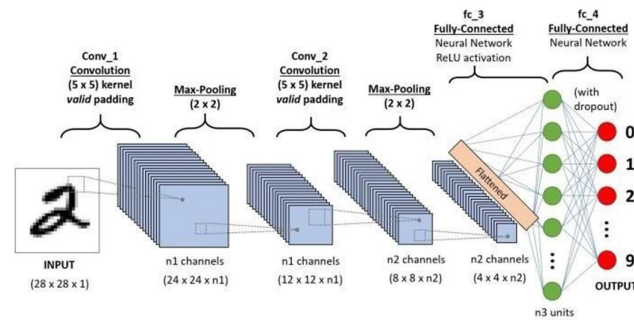


Fig3: Convolutional Neural Network

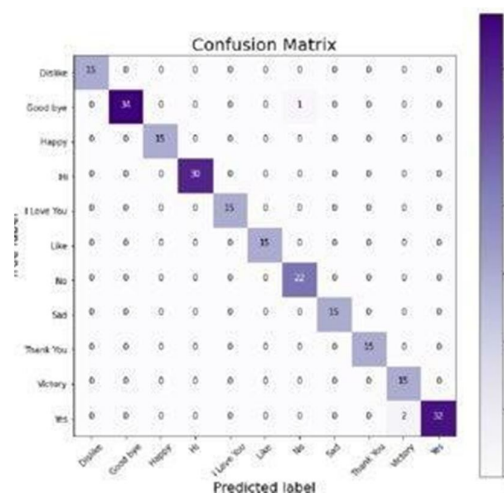


Fig 4: Confusion matrix of CNN

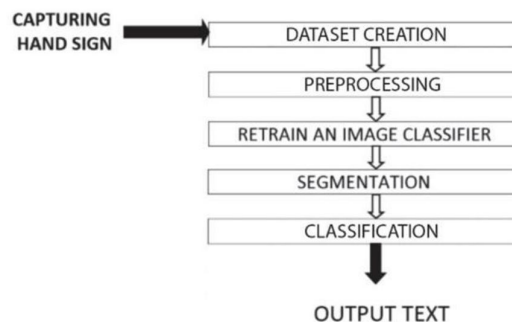


Fig 5: Implementation Process

IV. APPLICATION

- *Facilitate Communication between dumb and deaf with hearing people.*
- *Efficiently communicate human computer interaction .*
- *Helping children to communicate and fully express themselves.*
- *Improves social skills as well as confidence of specially able people.*
- *Provides opportunity to showcase their skills on different art platforms such as poetry, singing competition and so on...*

V. CONCLUSION

This model helps many dumb and deaf people. The proposed model takes input image and recognizes sign language. It is helpful for normal people to understand what dumb and deaf want to say. Our project aims to make communication simpler between deaf and dumb people.

RESULT

The sign language recognition system helps to recognize the words in Indian sign language and produce more than 76% accuracy. In palm gesture labelling it is capable of recognizing 26 alphabets and 10 numbers of ISL in an efficient way with the higher accuracy.

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