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HAND GESTURE RECOGNITION USING CONVOLUTION NEURAL NETWORKS

[1]Nancy Chellam E(182MCA45), [2]Dr. Shilpa Abhang

[1]Student, Dept. of MCA, Jyoti Nivas College

[2]Asst Prof, Dept. of MCA, Jyoti Nivas College

ABSTRACT

Indian sign language (ISL) system is one of the challenging issues as it is in the development stage, unlike other sign languages like American Sign Languages (ASL), and British Sign Languages (BSL) etc. This project purpose is mainly focusing at the classification of Indian signs using machine learning models. There've been various researches on American sign languages and standard data is available to consider it. As India is a multi-diverse country, there are several languages in different regions according cultures which results in different variants in sign languages for communication. So, there are very incomplete standard data sets of the Indian Sign Languages, which have variations and noises. Indian Sign Language uses both hands to mark gestures instead of one hand, unlike American Sign Languages and others. The features of Indian Sign Language lead to the blocking of many features and this is a major barrier to the lack of development in the area of Indian Sign Language. A simple CNN project for detecting Indian sign language. Here, I have executed CNN (Convolution Neural Network) using Kera's. This project mainly aims at support in the research of this field further by providing a data set of Indian Sign Language. A data of sign language was collected and researched for alphabets and numeric. Later, the features will be extracted from the collected segmented data using image pre-processing. Histograms are generated to map the created with images. In the final step, these features will be fed to supervised models for classification.

Keywords: Indian sign language, CNN, gestures.

I INTRODUCTION

The strong communication can be built amongst speech impaired people is by using gestures. Speech-impaired persons use gestures to communicate their thoughts and emotions, to draw attention to each other, and to emphasize contact. The movements vary from the language of the signs. The gestures are dependent

on the users of different regions and can be randomly used while speaking and interacting, but sign languages needs to be learned like any other languages. This makes the sign language is difficult to learn by the normal people. However, dynamic research in the area of computer visions and deep learning has given the concerns. The sign language be able to be translated into human understandable texts and their speeches. Many sign languages have been converted into signs recognition systems that overcome the communication barrier and offer new instruction and erudition skills for the deaf in the classroom. This translation system as became a needed for hearing-impaired community. Deaf community people are called as hearing-impaired people which is mentioned to as incomplete or complete damage of hearing. The communication problem can be resolved through making automatic recognition of SL powered by the latest technologies. SL is the language being used by deaf-dump community to undertake everyday activities such as conversation, teaching and learning, and social interactions as a means of instruction. It uses altered types of gestures and facial appearance to convey and convince meaning. It allows signers to communicate nonverbally to express their thoughts and emotion. In the nation, the speech impaired population uses more than 120 sign languages & American Sign Languages (ASL), Auslan, Russian Sign Language (RSL) and Indian Sign Languages (ISL) are the popular SLs.

II RELATED WORK

In paper [1], authors have portrayed an efficient Indian Sign Language Recognitions System (ISLR) is proposed for deaf and dump people using hand gesture images. The proposed ISLR method is regarded as a technique of pattern recognition that has two significant modules: extraction of features and classification. In order to understand the sign languages, the combined use of the (DWT) Discrete Wavelet Transforms based feature removal and closest neighbor classifier is used.

In paper [2], Recognition of sign languages is beneficial in communications between signers & non-signers. Various research studies on various systems of understanding of sign languages worldwide are in progress. The research is limited to a particular country as there are country wide variations available. The concept of this project is to create a system that can correctly translate the Indian sign languages in the number domain so that the less fortunate individuals can communicate with others around the world without the need for an interpreter in public places such as train stations, banks, etc.

In paper [3], Indian Sign Languages (ISL) or Indo-Pakistani Sign Language is possibly the prevalent sign language variety in South Asia used by at least several hundred deaf signers. It is clearly different from the sign languages of other countries in phonetics, morphology, and syntax. Since ISL has only recently been standardized, there is very little empirical work that has taken place in recognition of ISL. In this thesis paper, a novel method for recognizing static signs of Indian sign languages alphabet letters and numerals for Human Computer Interactions (HCI) has been suggested in order to understand the challenges in ISL gesture recognition.

In paper [4], In automotive user interfaces, touchless hand gesture recognition schemes are becoming relevant as they improve protection and comfort. Various machine learning algorithms have used color and depth cameras for gesture recognition, but it is still difficult to robustly distinguish gestures from various objects performed under highly varying illumination. Using 3D convolutional neural networks, we present an algorithm for drivers' gesture recognition from demanding depth and intensity data.

In paper [5], Sign Language Recognition in Computer Vision has emerged as one of the important areas of study. The challenge encountered by the researchers is that in both motion and presence, the instances of signs differ. A novel technique to the identification of different Indian Sign letters is therefore proposed in this paper, Where the signs' continuous video sequences are considered. There are three phases in the proposed system: Pre-processing stage, Feature Extraction & Classification. The stage of pre-processing requires skin filtering, matching the histogram. Eigen principles and Eigen Routes have been reserved into account for the function extraction point, and finally the measured Euclidean distance Eigen rate is used to identify the gesture.

III METHODOLOGY

The precipitate of the recommended approach is exposed in figure 1 with four stages: data acquisition, preprocessing, feature extraction, & recognition. As the input from the live webcam to the device, the pictures and video frames were given and the output was the estimated sign digit shown in both Dzongkha and English text. To add variations to the dataset, pictures were increased and the model was trained using CNN. To define the digits in real-time, the model was stored and loaded with OpenCV.

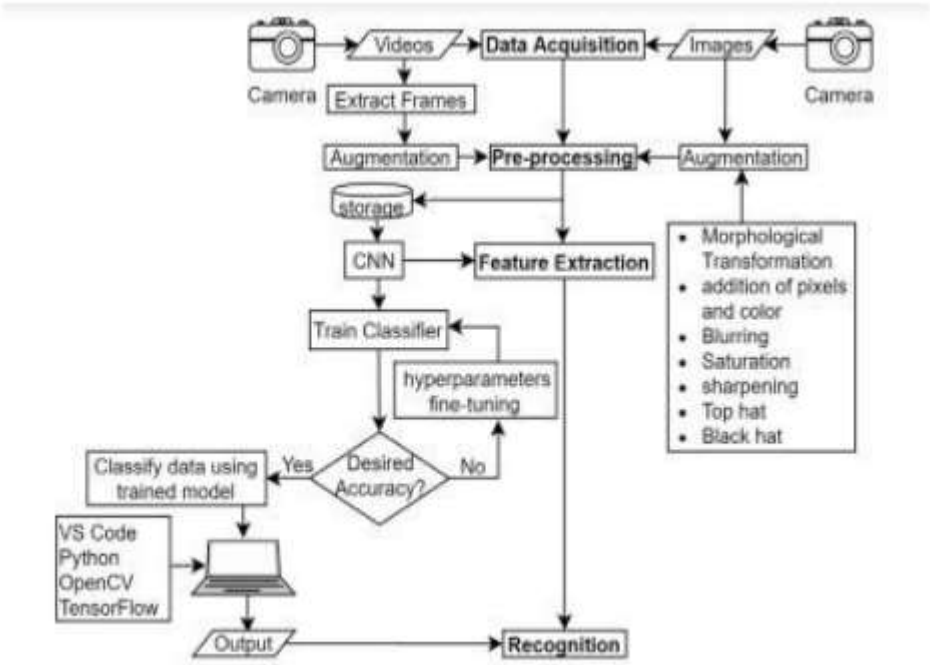


Figure 1

IV IMPLEMENTATION

Experimental setup

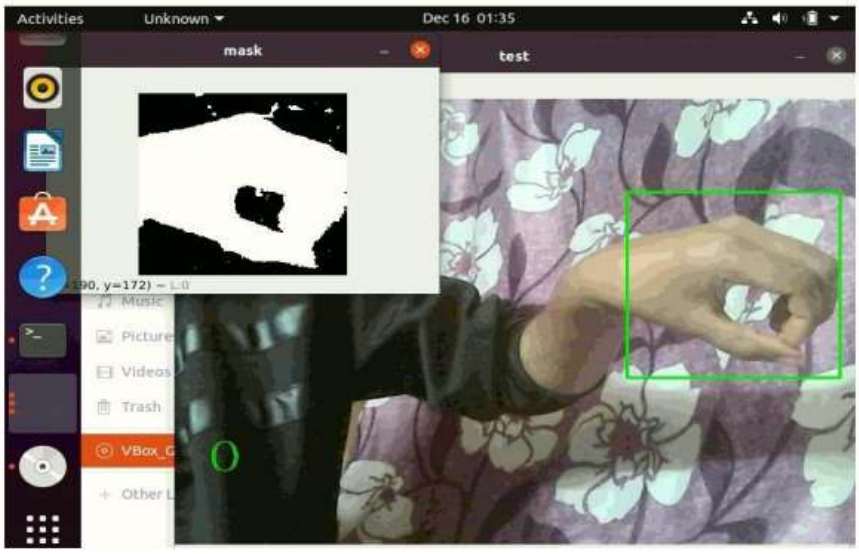
The Python SciPy environment installed ideally with Python 3.6.3, Keras is installed with TensorFlow, and other packages like Scikit-learn, Pandas, NumPy, and Matplotlib is installed. Minimum of 8GB RAM is

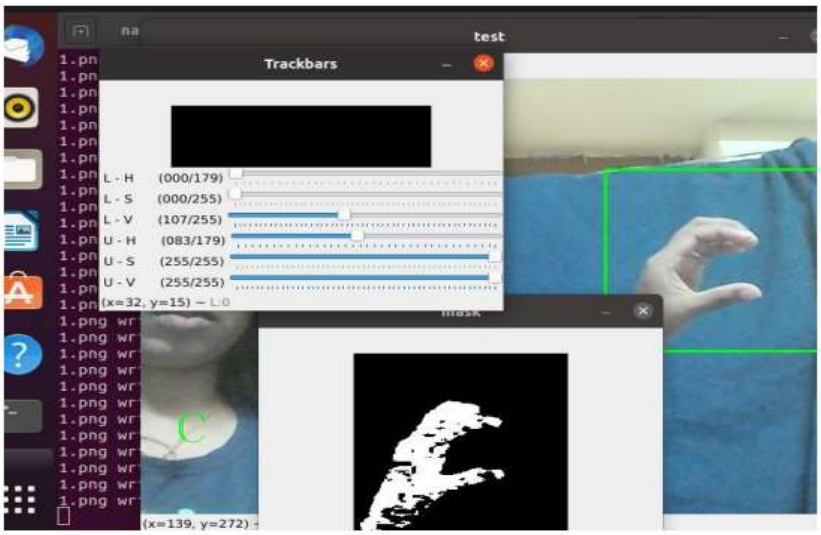
required. VGG16 Algorithm is used for feature extraction.

Method to Run this project

1. Install Python 3, OpenCV 3, TensorFlow, Kera's.
2. First Train the model.
3. python cnn_model.py
4. Now you just need to run recognise.py to test the model. Just open the terminal and then execute the following command to do so.
5. Python recognise.py To segment your hand color, adjust the HSV values from the track bar.
6. To build a data set of your own. Python Capture.py

Experimental Results





V CONCLUSION

The main neutral of this research was to recognize ISL digits via webcam in real-time in this paper. The ISL digits dataset was developed and evaluated in this study with various SL models. The outcomes of the planned CNN-based model underperformed these models. In training & testing, the durability of the model strategy was 99.94% and 97.62%, respectively. By increasing the number of images in the dataset and using Transfer Learning, such as VGG16, ResNet, and MobileNet, misclassification and testing accuracy could be decreased and improved, respectively. In the future, ISL alphabets and complex gesture detection can be studied.

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