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Sign Language Recognition System

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Abstract

This project primarily aims to help deaf and dumb people to communicate with the other people. Sign language recognition works as a way to solve many problems and gives easy comfort to human life. This method are divided into different stages such as pre-processing, feature extraction and feature classification, where many algorithms are used and extended to compare their merits.
Overall, the focus is on the study that it may provide researchers a broad introduction about the automated gesture and language recognition, and further we are putting the best efforts to make future research efforts successful in this area.

Keywords: *Python Language, Image processing, Thresholding, Voice Conversion.*

1. Introduction

Hand gestures are mostly used by the deaf and dumb peoples to avoid the communication gap with the other people and show their feelings towards others, it serves to gather all illustrations in our day to day talks. Sign language mostly involves hand gestures which consists of visual motions and signs that are used by the deaf and dumb peoples. For the speech impaired society, sign language plays an important role for day-to-day interaction. In sign language impaired persons can use hand, arm to interact with other people. However, sign language is not understandable among most peoples in the society due to which a communication barrier is created.

In sign language people mostly uses upper part of the body i.e. above the waist level. Besides, the same signs have different meanings when they are used in different sentences and are used at different locations. In human language hand gestures are of different types such as adaptors, emblems, and illustrators. Sign language is considered as a part of communication gesture. By doing improvement in technology, we can develop a framework which helps in converting the sign language gesture into human understandable text. However, the main aim of this paper is on sign language recognition i.e. how deaf and dumb people can easily be communicate by using hand gestures. ASL sign language is used as a communicating language to communicate with deaf and dumb people.

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2. Helping Libraries

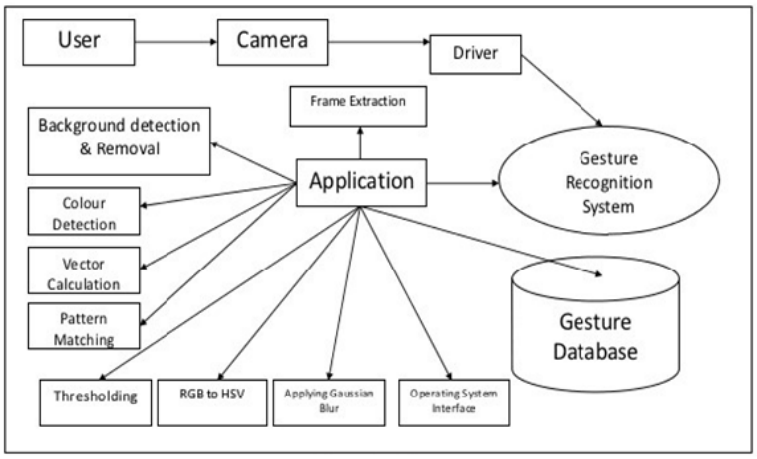
2.1 OpenCV

Open Source computer vision(OpenCV) is a library in python language which mainly focuses on real-time computer vision. It is mainly used to do the operations that are related to images such as image classification, image restoration, feature extraction. OpenCV now supports almost all algorithms that are related to real-time computer vision and machine learning and are expanding day by day.

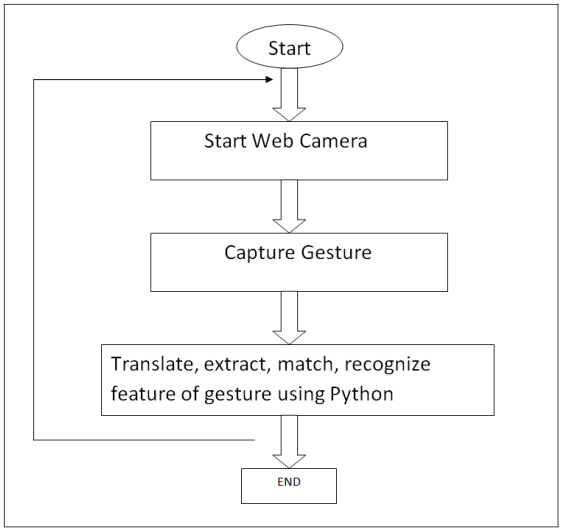
2.2 NumPy

Numeric Python(NumPy) is a library in python programming language. It is a general purpose array processing. It is a library that is generally used for working with arrays. It supports large arrays with high level mathematical functions that operate on those arrays.

3. General Architecture of the System



4. Work Flow of the Designed System



5. Algorithm

Step 1: Detecting image from primary or secondary camera and applying pre-processing techniques like gamma correction, blurring.

Step 2: Hand Segmentation using background subtraction algorithm

Step 3: Hand detection using thresholding and dilation

Step 4: Detecting contours of hand for getting the clear shape of hand

Step 5: Detecting area of contour, convex hull, and solidity

Step 6: Detecting the angle between fingers and aspect ratio of hand

Step 7: Finding all the defects in hand

Step 8: Finally classifying images using aspect ratio, convex defects and angle

END

6. Datasets

For this project one dataset is used which is **ASL** dataset.

American Sign Language (ASL) dataset

It is a collection of 10,400 images,400 images for each of the 26 classes. These gestures are recorded to provide a better accuracy. The gestures include alphabets 'A-Z' and all gestures are made according to the american sign language.

Conclusion

This project is developed as a tool that uses gesture recognition for reducing the communication barrier between the deaf and dumb community and the normal people. This project was developed in response to a prototype for checking the feasibility of recognizing gestures using image classification. Using the designed project, it is possible to convert hand gestures into text which can easily understood by normal people. The idea of the proposed system has greater possibilities of future expansions. If more programming logic is introduced, a greater number of gestures could be incorporated. From this gesture (sign) our system tells the meaning through the real time text output.

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