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Real-Time Sign Language Recognition System For Deaf And Dumb People

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Abstract

The real time sign language is important for people that have hearing and speaking deficiency generally called Deaf And Mute. It is the sole mode of communication for such people to convey their messages and it becomes vital for people to know their language. This paper proposes the tactic or algorithm for an application which might help in recognizing the various signs which is named Indian real time sign language. The images are of the palm side of right and left and are loaded at runtime. The method has been developed with reference to single user. The real time images are going to be captured first then stored in directory and on recently captured image and have extraction will happen to spot which sign has been articulated by the user through keras sequential model algorithm. The comparisons are going to be performed behind then after comparison the result are going to be produced in accordance through matched key points from the input image to the image stored for a specific letter already in the directory or the database the outputs for the following can be seen in below sections. There are 26 signs in Indian Sign Language corresponding to each alphabet out which the proposed algorithm provided with 95% accurate results for 9 alphabets with their images captured at every possible angle and distance i.e. for every alphabet even if have approximately 5 images at different angles and distances then the algorithm is working accurately for 45 types of inputs.

Keywords – Real Time Indian Sign Language, Feature Extraction, Key point Matching, Sign/Single hand Gesture Recognition

1. Introduction

To establish or make a medium for a communication or interaction with Deaf and Mute people is of utter importance nowadays. These people interact through hand gestures, facial gestures or body posture. Gestures are basically the physical action form performed by an individual to convey some meaningful information. Hand Gestures are a strong means of communication among humans. actually gesturing is so deeply rooted in our communication that folks often continue gesturing when speaking on the phonephone . There are various signs which express complex meanings and recognising them may be a challenging task for people that haven't

any understanding for that language.

It becomes difficult finding a well experienced and educated translator for the signing whenever and everywhere but human-computer interaction system for this will be installed anywhere possible. The motivation for developing such helpful application came from the very fact that it might convince be of utmost importance for socially aiding people and the way it might help increasingly for social awareness also . The remarkable ability of the human vision is that the gesture recognition, it's noticeable mainly in deaf people once they communicating with one another via signing and with hearing people also . during this paper we take up one among the social challenges to offer this set of mass a permanent solution in communicating with normal citizenry .

Sign language is categorized in accordance to regions like Indian, American, Chinese, Arabic then on and researches available gesture recognition, pattern recognitions, image processing are carried by supposedly countries also to enhance the applications and convey them to the simplest levels.

2. Literature Survey

As mentioned Above that numbers of researches have been carried out as it has become a very influential topic and has been gaining heights of increasing interest. Some methods are explained below:

The paper Real Time Hand Gesture Recognition Paper included the algorithm during which first the video was captured then divided into various frames and therefore the frame with the image was extracted and beyond that frame various features like Difference of Guassian. Scale space Feature Detector and etc were extracted though SIFT which helped in gesture recognition[1].

A different method had been developed by Archana S Ghotkar, Rucha Khatal, Sanjana Khupase, Surbhi Asati and MIthila Hadop through Hand Gesture Recognition for Indian signing consisted of use of Camshift and HSV

model then recognizing gesture through Genetic Algorithm, within the following applying camshift and HSV model was difficult because making it compatible with different MATLAB versions wasn't easy and genetic algorithm takes huge amount of your time for its development.[2]

A method had been developed by P Subha Rajan and Dr G Balakrishnan for recognising gestures for Indian Sign Language where the proposed that each gesture would be recognised through 7 bit orientation and generation process through RIGHT and LEFT scan. The following process required approximately six modules and was a tedious method of recognising signs[3].

A method had been developed by T. Shanableh for recognizing isolated Arabic signing gestures during a user independent mode. In this method the signers wore gloves to simplify the method of segmenting out the hands of the signer via color segmentation. The effectiveness of the proposed user-independent feature extraction scheme was assessed by two different classification techniques; namely, K-NN and polynomial networks. Many researchers utilized special devices to acknowledge the Sign Language[4].

Byung - woo min et al, presented the visual recognition of static gesture or dynamic gesture, during which recognized hand gestures obtained from the visual images on a 2D image plane, without any external devices. Gestures were spotted by a task specific state transition supported natural human articulation[8].

Static gestures were recognized using image moments of hand posture, while dynamic gestures were recognized by analysing their moving trajectories on the Hidden Markov Models (HMMs).

3. Proposed Methodology

The proposed algorithm consisted of four major steps which are namely Image Acquisition, Feature Extraction, Orientation Detection and Gesture Recognition which is also shown in the below given Fig 1.

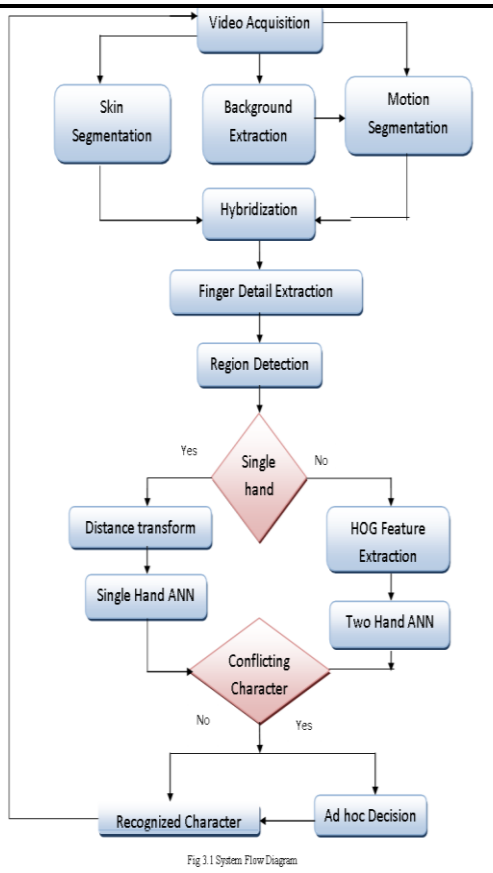


Fig 1. Step for sign recognization

All of the subsequent steps are explained in details within the later a part of the paper with all the knowledge on how the module is functioning and what behaviour the module is supposedly expected to portray. While deciding on the following
algorithm it was observed that pre-processing steps that are to be applied on the images for removal of noise in the background was not at all required and the approach was concluded to be simple and easy to implement

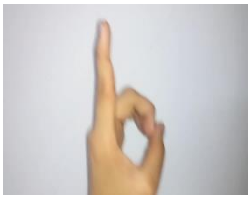
3.1. Image Acquisition

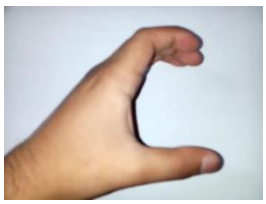
The first step of Image Acquisition as the name suggests is of acquiring the image during runtime through integrated webcam and while acquiring.The images will be stored in the directory as soonas they are captured and the recently captured image will be acquired and will be compared with the images stored for specific letter in the database using the keras algorithm and the comparison will give the gesture that was done and the translated text for the following gesture. The images will be captured through basic code of opening a webcam through capturevideo and then capturing the image through frames per second which will be stored in another directory where all the inputs images are stored in another directory and the recent captured image is picked up and the comparison with given set of images are made.

The interface of the application is provided with the button START when the user clicks on the button it works up to open up the integrated webcam and the button changes its status to STOP and when the user is ready with the gesture it can click R and that frame is captured and stored in the directory.

Gesture of letters shown in fig 2. are used for

testing the recognition algorithm[2].





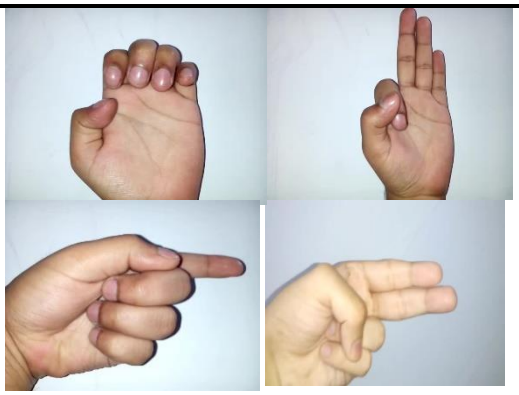


Figure 2. Gestures for different Signs

3.2. Feature Extraction

For any object there are many features, interesting points on the object, that can beextracted to provide a "feature" description of the object. Keras model sequential algo provide a set of features of an object that are not affected by many of the complications experienced in other methods, such as object scaling and rotation. The SIFT approach, for image feature generation, takes an image and transforms it into a "large collection of local feature vectors". Each of these feature vectorsis invariant to any scaling, rotation or translation of the image. To aid the extraction of these featuresthe SIFT algorithm applies a 4 stage filtering approach. A Sequential model is appropriate for a plain stack of layers where each layer has exactly one input tensor and one output tensor**.**

The model needs to know what input shape it should expect. For this reason, the first layer in a Sequential model (and only the first, because following layers can do automatic shape inference) needs to receive information about its input shape. There are several possible ways to do this:

- pass an input_shape argument to the first layer. This is a shape tuple (a tuple of integers or None entries, where None indicates that any positive integer may be expected). In input_shape, the batch dimension is not included.
- pass instead a batch_input_shape argument, where the batch dimension is included. This is useful for specifying a fixed batch size (e.g. with stateful RNNs).
- some 2D layers, such as Dense, support the specification of their input shape via the argument input_dim, and some 3D temporal layers support the arguments input_dim and input_length.

Dense layer is the regular deeply connected neural network layer. It is most common and frequently used layer. Dense layer does the below operation on the input and return the output.

where,

- **input** represent the input data
- **kernel** represent the weight data
- **dot** represent numpy dot product of all input and its corresponding weights
- **bias** represent a biased value used in machine learning to optimize the model
- **activation** represent the activation function.

result is the output and it will be passed into the next layer.

The output shape of the Dense layer will be affected by the number of neuron / units specified in the Dense layer. For example, if the input shape is **(8,)** and number of unit is 16, then the output shape is **(16,)**. All layer will have batch size as the first dimension and so, input shape will be represented by **(None, 8)** and the output shape as **(None, 16)**. Currently, batch size is None as it is not set. Batch size is usually set during training phase.

two-dimensional inputs, such as images, they are represented by keras.layers.Conv2D: the Conv2D layer.

3.3. Gesture Recognition

Finally when the whole process is complete the application will then convert the gesture into its recognized character or alphabet which might be helpful to be understood in layman‟s language. The following process includes passing out the single dimensional array of 26 character corresponding to alphabets has been passed where the image number stored in database is provided in the array. Supposedly if the image 2.jpg is of „B‟ character inthe database then 2 is passed in the array. Thus the image is picked up from the array and corresponding alphabet is displayed in the interfaceas shown in the given interface below.

Figure 3. The output in the interface for character 'P'

Figure 4. User Interface

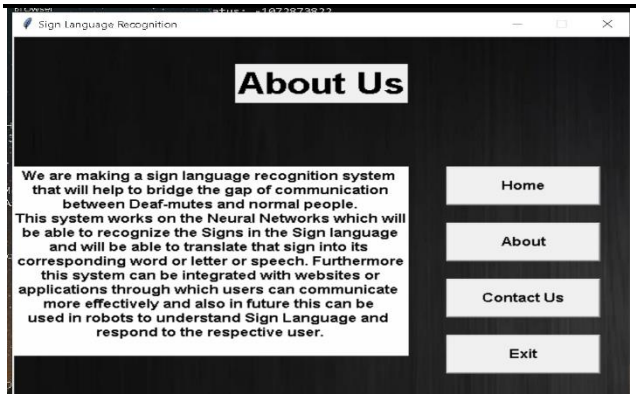


Figure 5. About As User Interface

4. Conclusion

The Results shows in Fig 3 presents the output for the sign/gesture for character „P". With our algorithm we were able to decode a video successfully with frames. The frame extraction comes within the second where the user presses the button STOP. The features were efficiently extracted.

5. Acknowledgements

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