Interpretation of sign language for physically challenged using machine learning

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Abstract:-
One of the common ways to communicate with the deaf people is sign language. Sign language helps them to understand in a very easy manner and it also helps them to communicate. But they should learn sign language in order to communicate. Learning is a huge process and also a difficult task. Initially by using finger spelled task one can learn the sign language. Different signs are assigned to understand different words. The main aim of the project aims at collecting the different datasets and different features are extracted which are very useful and different approaches were used. Also many four folded results have been used to extract many of the information by using many approaches. Also from many of the previous work the results were verified and given many validation sets to train the data.

Keywords: ISL, Sign language, Machine learning, Deaf people.

1. Introduction

People who cannot speak usually use their hands signs and also sometimes gestures in order to communicate with the people. Different signs were used to understand the language. All the alphabets of English language were assigned with different signs of hand gestures and all those were grouped together to become a word which is understandable by the deaf people as shown below.
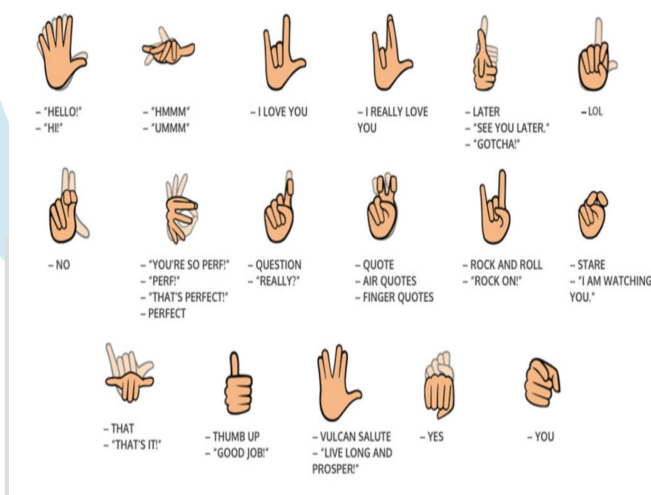

Fig 1.1. Different signs of hand gestures

Assignment of different signs to all 26 alphabets of English is shown below.

Image processing is one of the basic important operations that are used to enhance only a part of image.
Image processing is one of the rapid fields which are used everywhere and also growing everywhere.
This will mainly include the following steps
- Image importing by using different types of image acquisition tools.

- Image manipulation and analyzation of image
- Analysis of the image based on the results obtained.

DIGITAL IMAGE PROCESSING

These techniques mainly consist of image manipulation using different digital computers.
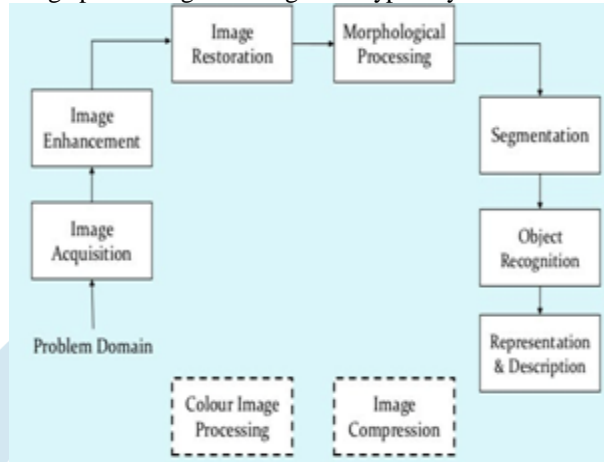There are many stages in this digital image processing. The stages are typically shown below;

Fig 1.2. Typical block of digital image processing

Digital image processing is a process of representing an object by having a series of operation in order to get a accurate result.

Problem Statement

People who cannot talk are called deaf ones and they will use this sign language to communicate with each other. But these signs are very difficult to understand by normal people. So in order to understand some system should be developed by using different signs to convey to normal people. So this system will help to develop a bonding between normal and physically handicapped people.

Description about Work

Communication has become one of the problems for Deaf people. So in order to help them system was developed to communicate to deaf people through sign language.
Conversion of sign language and gestures into text format is called as sign language.
This sign language should be understandable by computer and also to develop a human computer interface (HCI).
The gestures made by humans are detected using this HCI. This work focus on processing of image and matching of template.

Recognition of Hand gesture

System that is used in order to recognise the language is sign language recognition. These are based on various sensors, in order to extract features and also to do classification.

Fig 1.3. Sign language translation using Gloves

2. **Architectural Design for Proposed System**
   - Sign language detector is built in order to help deaf people by tensor flow object detection and also a python language.
   - All the images are collected using open CV and python.
   - Images are captured using webcam which will be trained.
   - The images which are captured and trained will be labelled for different signs.
   - Detection of images in real time is done by using python and open CV.
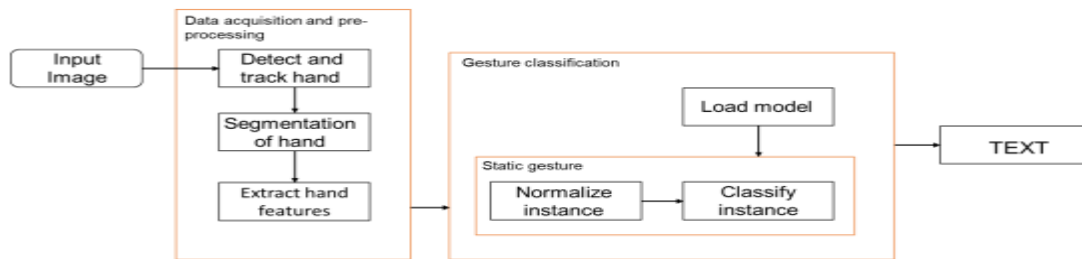
Design flow

Fig 2.1. Work design flow

Considering image processing separation of the objects from the images and then to identify and then classification is done.
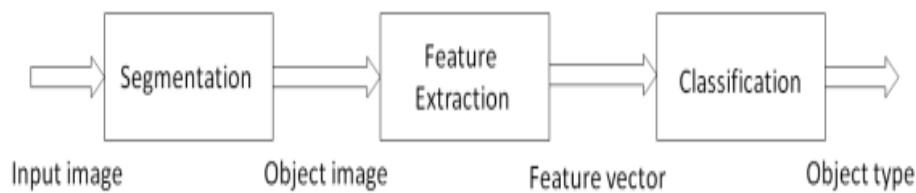

Fig 2.2. Different phases of recognition of pattern

In the process first we have image segmentation and separation of object. So usually in this phase extraction of feature is done then the objects are measured.

All these features were extracted and then given for vector classification.
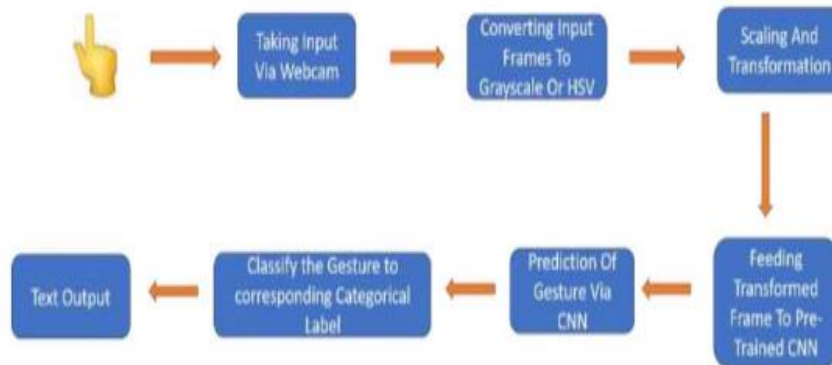
Network Architecture

Fig 2.3. Architecture of system of high level

As shown in the above figure first the image is segmented with the help of a webcam. From the videos all the frames are dropped. CNN model with 11 layers are used here.

The image is then converted to gray scale image and then that image is trained.

The dataset obtained is a RGB images which are then converted into greyscale. The greyscale image is then scaled to the respective size and then the model is fed to CNN model. From that it is classified and labelled. The gesture that is classified will be displayed as text.

3. Proposed Methadology

In this proposed Methadology the work flow is divided into stages;

  a. Acquisition of data
  b. Pre processing of data
  c. Extraction of features
  d. Data classification
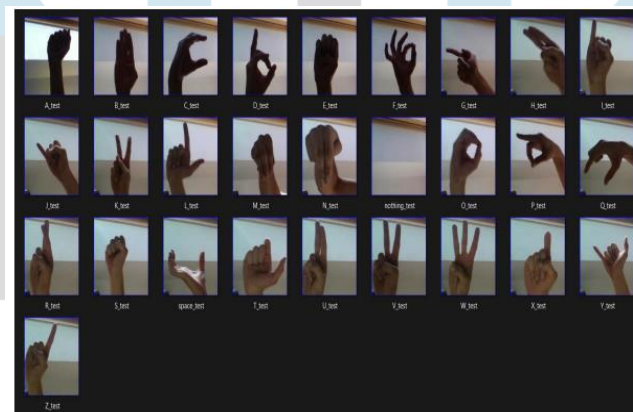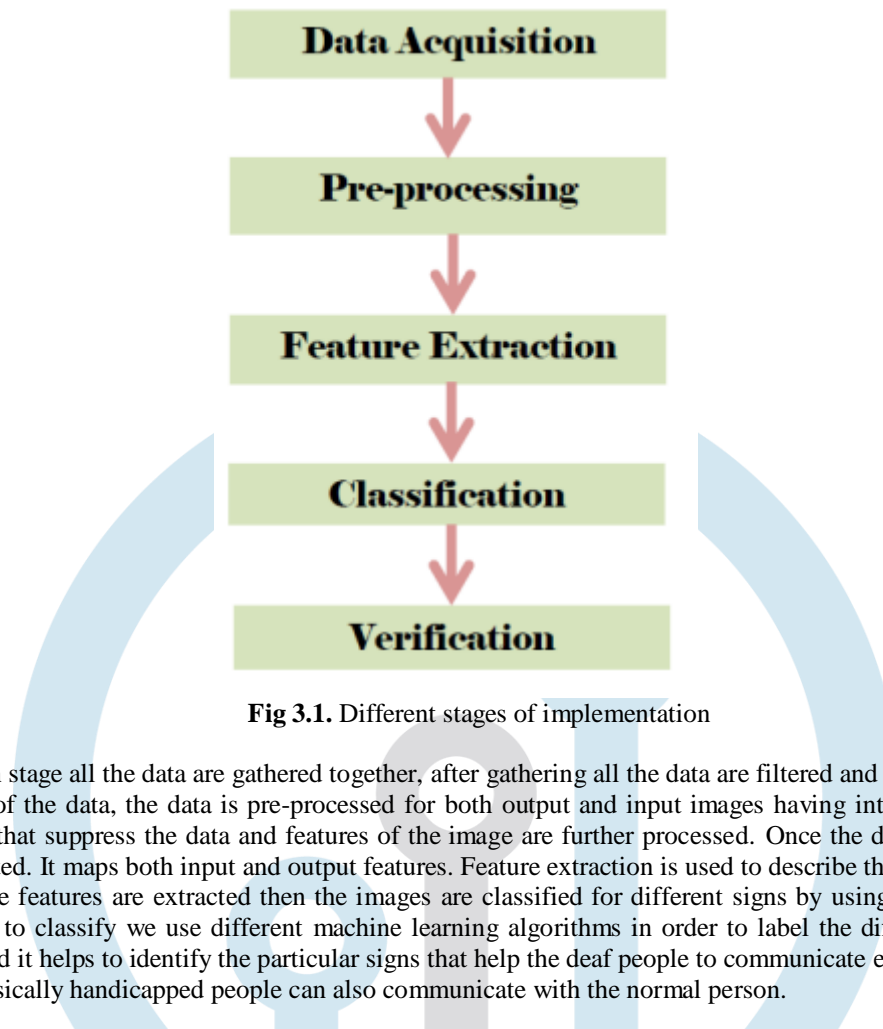 e. Verification of data

Fig 3.1. Different stages of implementation

In the Data acquisition stage all the data are gathered together, after gathering all the data are filtered and data are cleaned.
After the acquisition of the data, the data is pre-processed for both output and input images having intensity. In this stage data improvement is done that suppress the data and features of the image are further processed. Once the data is pre processed next the features are extracted. It maps both input and output features. Feature extraction is used to describe the specific shape and sign of the image. After the features are extracted then the images are classified for different signs by using a collection of datasets given below. In order to classify we use different machine learning algorithms in order to label the different signs. Finally the verification is done and it helps to identify the particular signs that help the deaf people to communicate each other.
Also with this the physically handicapped people can also communicate with the normal person.

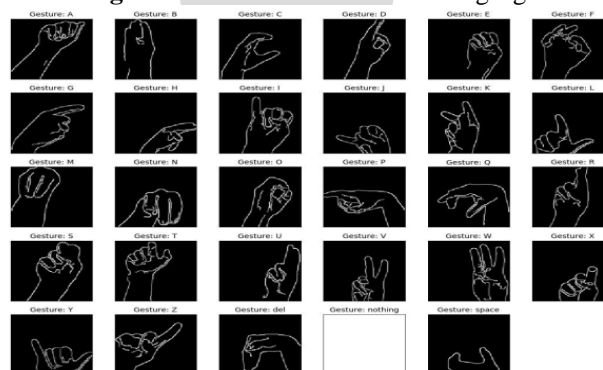**Fig 3.2.** Collected data sets indicating signs

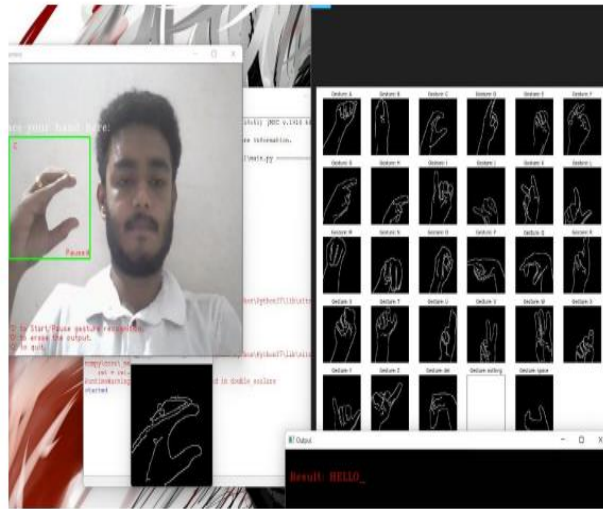**Fig 3.3.** Images with removed edges

4. Output

Fig 4.1. Capturing Sign to Display the Text "HELLO"

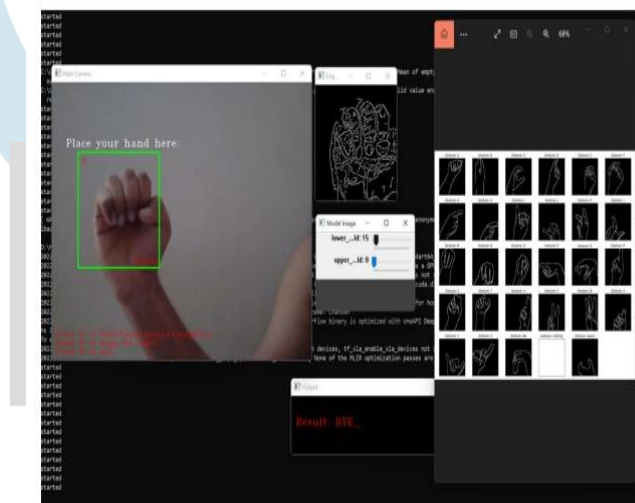**Fig 4.2.** Text Output Displayed for "HELLO"

Fig 4.3. Capturing Sign to Display the Text "BYE"

Fig 4.4. Text Output Displayed for "BYE"

5. Result

When the proper gestures are given to system, the system provides the corresponding results which are loaded with different signs. Also there will be a variation with different persons for performing the gestures. So all these are identified by the system and give the respective words which are assigned to the system which will help for the deaf people to recognise and communicate with the normal person.

6. Conclusion

Sign language interpretation is one of the important languages for deaf people. Once the different signs are assigned for each alphabets then it will be loaded to the system. The system captures the image and that image has to undergo image enhancement, image enhancement are of different methods. Then once enhancement is done it undergoes various feature extraction once the features are extracted by the computer. Finally we can conclude that this sign language is very useful to the deaf people and mainly these can be used in hospitals, counters where tickets are issued.

FUTURE ENHANCEMENT

In the future the model can be made in such a way that the datasets can be trained such that it can automatically capture the image by deleting the background. Also this model can be worked towards the development of two hand integration to identify the symbols.

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