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Shrug and Voice Recognition System for Dumb and Hearing Impards

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Abstract: Now a day physical challenges cause limitations in basic learning processes like reading, listening, writing and accessing resources like websites. These causes made difficult to communicate with the society. This project will help dumb and hearing impards who cannot communicate easily with others. To develop the interface for impards with normal people, this project proposes the medium which translates the sign language and voice into text. The gesture from mute communities is converted into text. Similarly the voice information from the normal people is converted into sign and text as visual representation for deaf communities.

Index Terms: pattern matching, gesture recognition, SVM algorithm, framing, HMM model, Preprocessing.

1. INTRODUCTION

Different type of disabilities requires some support to handle that problem and multiple disorders will become more complicated. Therefore additional efforts are needed to overcome those problems. Sign language is a communication skill which uses the gestures instead of using sounds to communicate with others. This will reduce the barrier to deaf and mute people. To communicate words and sentences the signs are used. Some of the disability factors are given below:

- Visual Impairment
- Mobility Impairment
- Hearing Impairment
- Vocal Impairment

2. IMPLEMENTATION

Shrug Recognition

Implementation process contains the following steps:

Fig 2: Schematic View of Hand Gesture Recognition System.

Skin Color Training

Process of finding skin colored pixels and regions in an image in the skin color training. This is the preprocessing step in an implementation process. Here the skin detector transforms the selected pixels into appropriate color spaces. Then skin classifier which classifies the pixels as either skin or non-skin pixel is used.

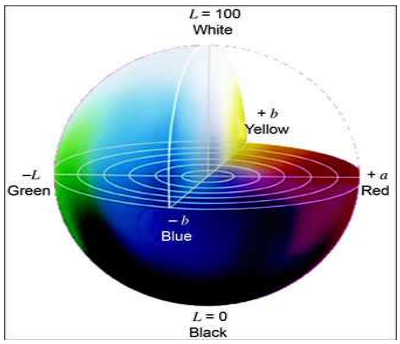

Fig 1: Color Space Model

Calibration

In some cases, the problem arises with skin color objects and background shown below:

Fig 3: problem with skin color objects and background

In order to overcome this problem the calibration process is used. The process of extracting the symbol from the background is called as calibration.

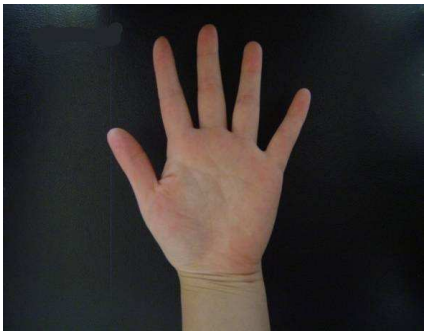

Fig 4: Extracting the symbol from the background

Hand location detection

After extracting the symbol from the background, we have to find the location of the symbol in an image. Then the bounding box is created which contains the gesture with any different colors. The bounding box with the symbol is then considered as a sample pattern.

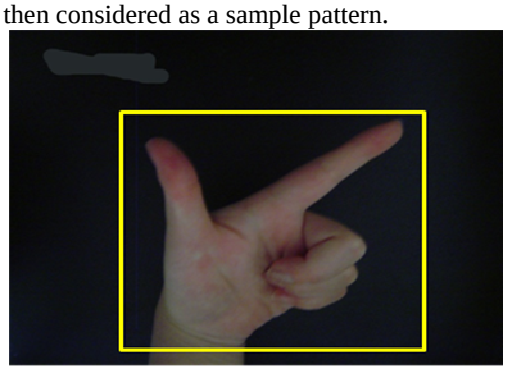

Fig 5: Finding location of hand and creating bounding box

Finger Region Detection

By examining the bounding box, we have to find the number of finger regions. Only with the border of the image we cannot find the gesture. Therefore the number of finger regions found to be compared with the reference pattern stored in the database. For the simplification remove all the small connected regions as shown in the following figure:

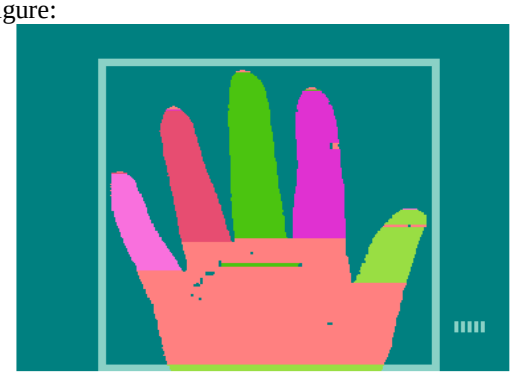

Fig 6: Connected finger regions.

Pattern Matching

Shrug recognition consists of data acquisition, space transformation, recognition and matching. Before compared with the pattern stored in database, preprocessing steps are implemented with line detection, circle detection, parameterization. Normally the system is not practical for large number of gestures and complicated ones.

Gesture Determination

To recognize the gesture the sample pattern is compared with reference pattern. The number of finger regions and number of large connected regions of fingers and hand is determined. Then the ratio of the finger to the space between the fingers is calculated. And this ratio is compared with that of the reference pattern stored in the database.

Fig 7: Gesture Determined

Voice Recognition

Shrug recognition is used only for dumb people. To overcome the barrier with deaf people the voice conversion system is used. There are two methods of voice conversion. Voice information is converted into appropriate signs as visual representation for the deaf people who are known sign language. But the people who do not know sign language cannot understand the gestures. For this the recognized gesture is again converted into text.

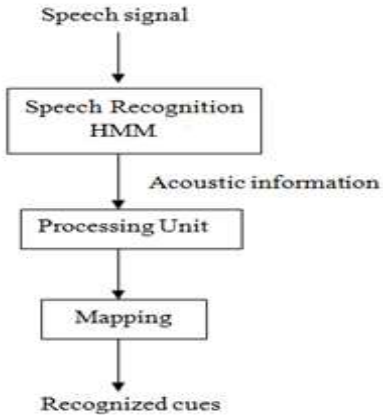

Fig 8: Speech to Cues Conversion

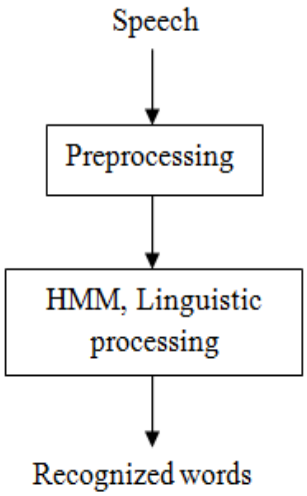

Fig 9: Speech to Text Conversion

- The speech signal is given to the recognition unit where HMM process is used to recognize the sequence of words. Hidden Markov Model (HMM) is the statistical model which can be well characterized like parametric random process. The parameters of this process can be precisely determined.
- In preprocessing unit the speech signal is converted into number of frames. Then they are examined to extract the useful information in the given speech.
- Then the speech samples are compared with the patterns already stored in the database. Then the recognized cues are displayed for the people who are known sign language. Again the cues are converted into text as visual representation for the deaf people who are not known sign language

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3. ALGORITHM USED

Support Vector Machine: SVM is the train algorithm with pattern matching concept. The word training indicates that the efficiency of the result will be increased with the number of times we trained. SVM produces the hyperplanes which separate the different types of classes shown below:

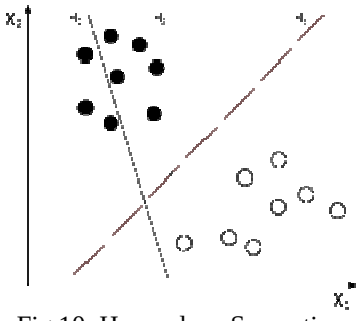


Fig 10: Hyperplane Separation

H_1 does not separate the classes, H_2 does, but only with a small margin, H_3 separates them with the maximum margin

$$\sum \square \; K(x_i, y) = \text{constant}$$

Here,

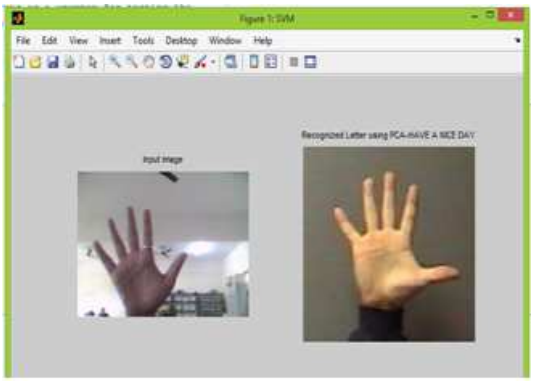
P → parameter selected

K (x_i, y) → kernel function

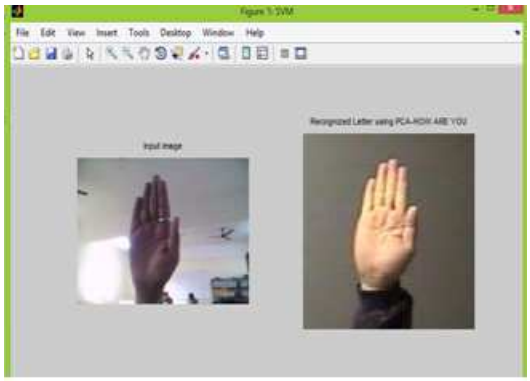
Each term in the sum measures the degree of closeness of test point y to the corresponding data base point x_i.

RESULT

Sign language is the useful tool to ease the communication between the deaf and mute community and the normal people. The simulated output shown in the following figure:



(a)



(b)

Fig 11: (a, b) simulated output

4. CONCLUSION

In future, many companies will produce variety of applications with speech synthesis and SL conversion separately. In this project the communication barrier between normal people with deaf and mute communities will be reduced.

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