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Image Processing Based Language Converter for Deaf and Dumb People

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Abstract *: This paper presents a language converter for deaf and dumb people. In the present world it is very difficult for the deaf & dumb people to talk with the ordinary people. So it becomes impossible for them to communicate with the ordinary people unless and until ordinary people like us learn the sign language for the purpose of communication. The sign language of deaf and dumb is quite difficult to learn and it is not possible for everybody to learn that language. So every person cannot come and share their thoughts with these physically impaired people. So here is a system which would enable the deaf and dumb to communicate with each and every one. In this system a webcam is placed in front of the physically impaired person. The physically impaired person would be wearing colored rings in his fingers. When he makes the gestures of the alphabets, the webcam will capture the exact positions of the rings and perform image processing using color recognition to determine the co-ordinates of the colors. The co-ordinates captured will be mapped with the one previously stored and accordingly exact alphabet will be captured. Continuing in this way physically impaired person will be able to go through the entire sentence that he wants to communicate. Later on this sentence will be translated into speech so that it would be audible to everyone.*

Keywords *- Webcam, Physically Impaired, Gestures, Color Recognition, Image Processing.*

1. INTRODUCTION

The need of this system is to give output in day to day life for "Image Processing Based Language Converter for Deaf and Dumb" software. It will explain the aim and whole declaration for the evaluation of system. It will also explain system constraints, interface and interactions with other external applications. An attempt has also been made to explore about the need and motivation for interpreting ISL, which will provide opportunities for hearing impaired people in industry. The aim of the proposed project is to overcome the challenge of skin color detection for natural interface between user and machine. This project is developed for the physically impaired people would be beneficial as they can communicate with everyone.

In our system a webcam is placed in front of the physically impaired person. The physically impaired person would be wearing colored rings in his fingers. When he makes the gestures of the alphabets, the webcam will capture the exact positions of the rings and perform image processing using color recognition to determine the co-ordinates of the colors. The co-ordinates captured will be mapped with the one previously stored and accordingly exact alphabet will be captured. Continuing in this way physically impaired person will be able to go through the entire sentence that he wants to communicate. Later on this sentence will be translated into speech so that it would be audible to everyone. By using this system the physically impaired people would be beneficial as they can communicate with everyone freely which indeed would be great achievement for the mankind.

2. EARLIER WORKS

Ibrahim Patel And Dr. Y. Srinivas Rao[1] proposes an Automated speech synthesizer and converter in cue symbol generation for hearing impairs. For the interaction of normally speaking personals with hearing impairs the communication gap leads to a non-interactive medium for the two communicators. To develop a communication approach in this paper we propose a medium for the conversion of speech signal to visual cue symbols by automatically synthesizing the given speech signal and mapping to cue symbols for visual representation. In this system is focused with the objective of reducing the communication gap between normal people and vocally disabled.

Anbarasi Rajamohan, Hemavathy R., Dhanalakshmi[2] proposes a Deaf-Mute Communication converter. Deaf-mute person has always found it difficult to communicate with normal people. The project aims to facilitate people by means of a glove based deaf-mute communication interpreter system. For each specific gesture, the flex sensor produces a proportional change in resistance and accelerometer measures the movement of hand. The glove includes two modes of operation – training mode to benefit every user and an operational mode.

3. PROPOSED METHODOLOGY

For implementation of this system we require different colors rings having different colors and web camera is required for capturing the gestures. The person would be placing color in his fingers. When the user makes the gesture of an alphabet while implementing system there are different modules involve in the system are as follows:

1. Camera interfacing

At the time of giving gesture it is necessary to interface the camera. Camera interfacing is use to capture the frames continuously and gives the captured frames to the next phase that is RGB to Binary conversion phase.

2. Binary conversion

Here RGB to gray and then gray to binary conversion takes place.

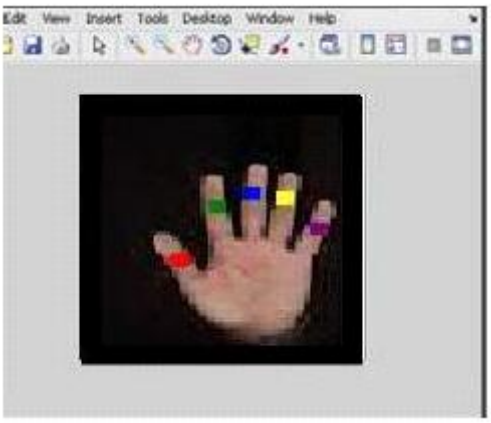

Fig: 1 Real image

Fig.:2 Binary image

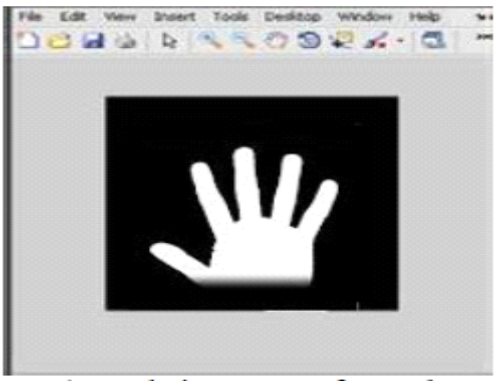

Fig:3 Binary image(Mask Image After Thresholding)

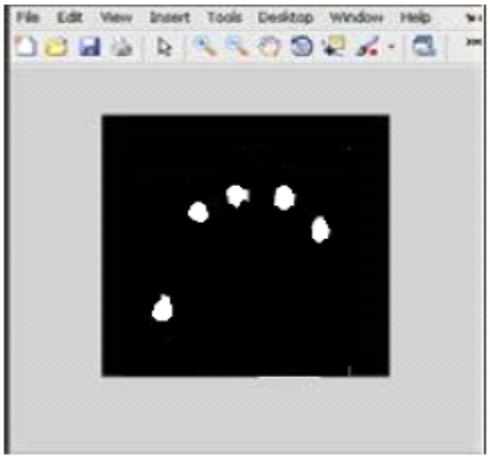

Fig: 4 Only the area of interest is preserved is discarded

3. Gesture recognition

The webcam will capture the exact positions of the rings and the system perform image processing using color recognition to determine the co-ordinates of the colors. The co-ordinates captured will be mapped with the one previously stored and accordingly exact alphabet will be captured. The pre-processing module of the system developed involves the application of morphological operations and color recognition is system is mostly classified into three major steps after acquiring the in order to segment the image into regions of interest.

4. Color Recognition

Color recognition is one of the most important things in computer vision. The color recognition process serves to simplify the analysis of gestures by drastically reducing the amount of data to be translated, and eventually preserving useful structural information about object boundaries. Color recognition in gestures is far more challenging task than gray scale images as color space is considered as a vector space. Almost 90% of color information in a gesture can be found in the corresponding gray scale image.

5. Mapping

Fig:(a)original image

(b)edge image
Fig 5. Sample image of 26 alphabets

4. SYSTEM DESIGN

The motto of this system is to develop a sign language education and recognition platform for hearing impaired peoples and communication system for dumb people to convey their message.

Fig 6: Training Module

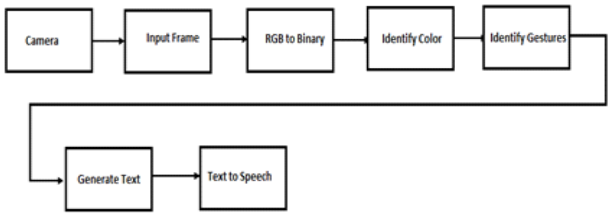

Fig 7: Actual Working

5. DESIGN AND SPECIFICATION

Let S be a gesture recognition system that recognizes gesture.
S = (I, G, M, F, O)
Where, I is a set of input gestures;
G represents a set of single-color static gestures;
M represents co-ordinate mapping operations such as

Table 1 : Alphabate Mapping

Binary Code	Alphabets
0001	A
0010	B
0011	C
0100	D
0101	E

F represents feature vector for G.
O represents output with application interface (A);
G = {G1, G2, G26}
I = {I1, I2I26}
G M
F = {f1, f2f26}
O = {A1, A2 A26}
Success of the system will be rely on when
(i) Ii=Fj where Ii I
Fj F where 1 <= j <=26

Failure of the system when
(ii) For a gesture (I) no feature vector is found
IiFj where Ii I
Fj F where 1 <= j <=26
(iii) For two different gestures (I) same feature vector found
Ii=Fj and Ik=Fj where Ii, K I

Fj F where 1 <= j <=26

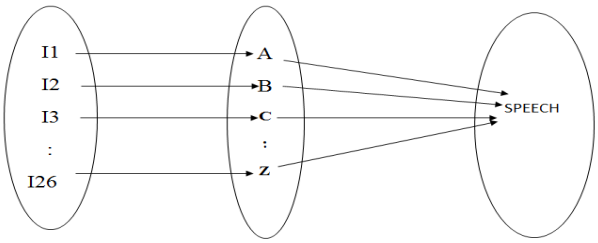

Fig (a) Multiplicity Constraints for Language Converter

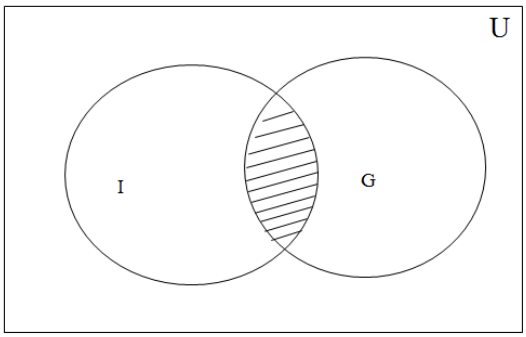

Fig (b) Venn diagram

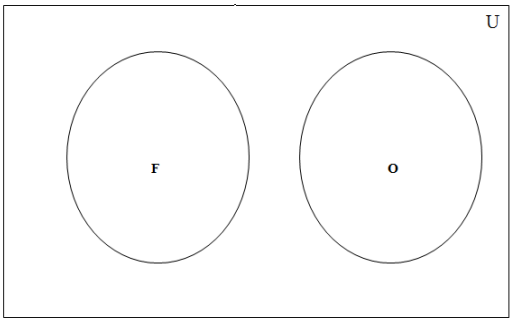

Fig (c): F∩O=Φ

RGB to Binary image conversion algorithm
Step 1: Set Red filter's minimum value
Step 2: Set Red filter's maximum value
Step 3: Set Green filter's minimum value
Step 4: Set Green filter's maximum value
Step 5: Set Blue filter's minimum value
Step 6: Set Blue filter's maximum value
Step 7: Scan through the image horizontally & vertically
Step 8: Store the current RGB value in variables
Step 9: Compare the variables' values with the set filter values
Step 10: If current value fits in the filter range, set the pixel white in the binary image
Step 11: If current value DOES NOT fit in the filter range, set the pixel black in the binary image.

6. CONCLUSION

The proposed method is tested on different gestures. It produce fairly stable and good results Every person cannot come and share their thoughts with these physically impaired people. So we have come up with a system which would enable the deaf and dump to communicate with each and every one by using the image processing based language converter and sign language recognition system proposed for human computer interaction using Image Processing Technique.

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