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Gesture Controlled Speaking Assistance for Dump and Deaf

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Abstract— *Our project mainly addresses to facilitate deaf and dumb persons life style. Dumb and deaf people communicate with common people throughout the world using hand gestures. But common people face difficulty in understanding the gesture language. To overcome these real time issues system is developed. This is a user friendly, cost effective system which reduces communication gap between dumb and deaf with ordinary people. The proposed system captures a hand gesture using the high definition Pi camera. Image processing of captured gesture is done on Raspberry pi 2. Amplified audio corresponding to each processed gesture is the final output.*

Index Terms—*Image processing, Hand gesture,Python,open CV*

I. Introduction

Speech and gestures are the expressions, which are mostly used in communication between human beings. Our project mainly analyses the visual data from a camera. A processing platform of Raspberry pi used for recognizing these signs or gestures. These recognized gestures are further converted into speech. The intention of sign language translation is to translate the normal sign language or gestures into speech and make easy communication with dumb and deaf people. In order to improve the life style of dumb and deaf people the proposed system is developed.

Image processing is the basic technique implemented in this project. Raspberry pi2 act as the processing platform. Processing involves basic image processing techniques such as blurring, masking and eroding along with coded program logic. A continuous real time stream of video data captured by the pi camera is the basic input to the processing system. Image processed input visual data is mapped on to its corre-sponding audio. The audio signal is then amplified using an amplifier.

II. Proposed System Working

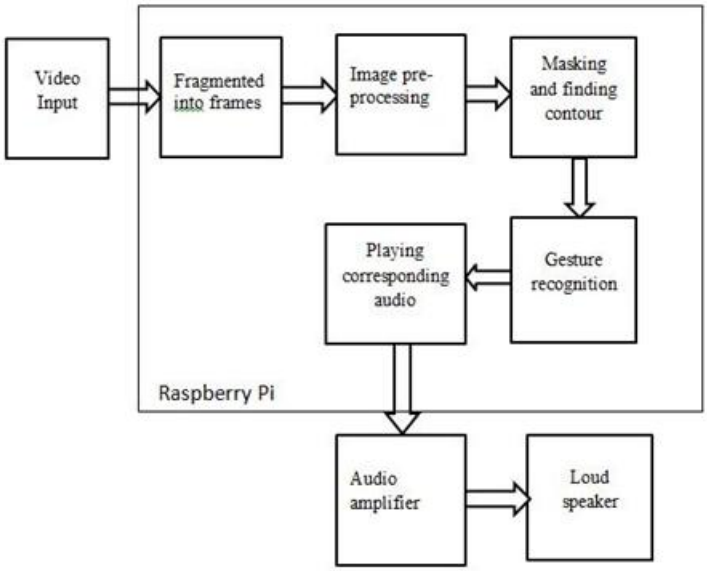

Fig. 1. Block diagram of the system

Fig. 2. Thresholded Image

The block diagram showing the architecture of the proposed system is shown in Figure.1 The system mainly consist of a high definition Pi camera , Raspberry pi2 module and an audio amplifier . Real time continuous stream of video is being captured using the Pi camera, which is an optical instrument for recording or capturing images which could be stored locally , transmitted to another location or both. The captured video is given to Raspberry Pi as the input where it is fragmented into frames. Each frame is cropped to get region of interest and blurring operation is applied.

It is known that Hue, Saturation and Value of human hand is in range 0-30,30-180 and 60-255 respectively .each frame is checked for human hand presence by analyzing HSV values. Only if HSV range is matched with human skin HSV ,then masked to get binary mage .Morphological operations like dilation and erosion are applied to get a better thresholded image. Figure.2 shows a thresholded image. From this biggest contour is found out and centre of the binary image is found out.Figure.3 shows the biggest contour of the thresholded

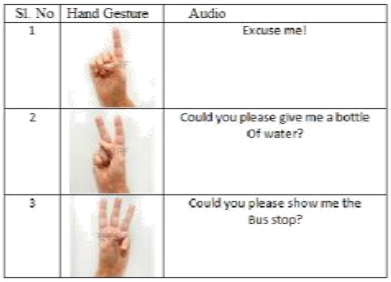

Fig. 5. Identified hand gestures

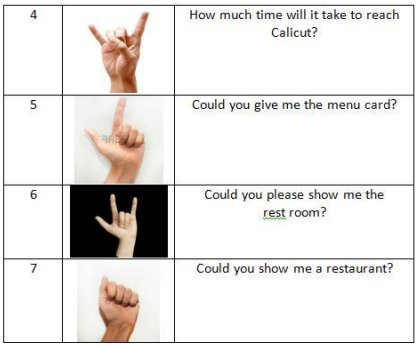

Fig. 3. Biggest contour

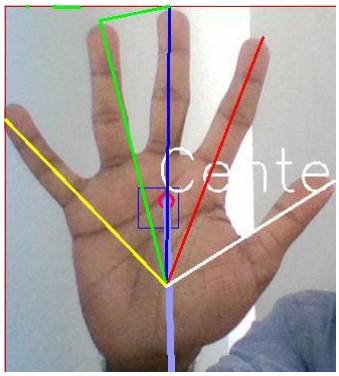

Fig. 6. Identified hand gestures

Fig. 4. Lines drawn to detected fingers

image in Figure.2 A line L1 is drawn to the farthest point of the contour from its center. The points on the contour which are a distance greater than 75 percentage of length of L1 are found out and from these, the points which maintain a minimum distance 40 pixels from each other are selected. Then lines are drawn to these points from the center of the contour and the biggest angle between the lines is calculated. By checking number of lines and biggest angle, each gesture is recognized and corresponding audio is played. Figure.4 shows the linest drawn to finger tips from the center.An audio amplifier is used to amplify the signal level and output is given through loudspeaker.

III. Implementation Results

The gesture recognition based speaking aid for dumb and deaf is developed. Gesture recognition is done using image processing. For processing a gesture, the raspberry pi board is used. The task of real time image processing is quiet complex. Since the focus of this project mainly concentrates on hand gestures, the first preference was to choose human hand as the region of interest for the processing. HSV tracking is done using the open CV python language. From analysis, it is found that Hue, Saturation and Value of human hand is in range 0-30, 30-180 and 60-255 respectively. Identified human hand is subjected to a sequence of image processing steps which includes blurring, cropping, eroding and masking. Audio files will be saved within the Raspberry pi. Audio mapping is done using python program. Using the above techniques, we have successfully developed the voice conversion of 11 different hand gestures as shown in figure 5,6,7.
We tested hand gesture recognition with five people and out of 11 different hand gestures 9 worked properly with an efficiency of 70

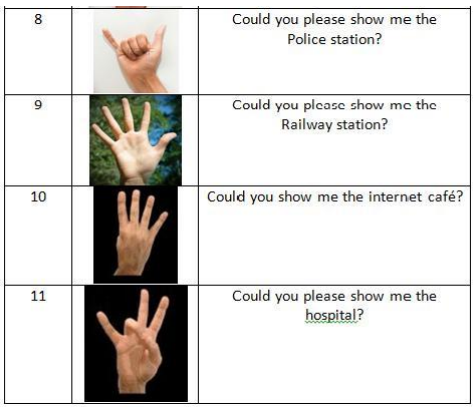

Fig. 7. Identified hand gestures

Variations in lighting results in degradation of pixels which affects correct determination of hand gesture. Correct position-ing of hand with camera is also important. HSV variation from person to person affects the efficiency of gesture recognition. The real time image processing capability of Raspberry Pi is limited due to lack processing speed. For efficient real time processing more powerful processors such as ARM, GALILEO etc. are required.

IV. Conclusion

This project aims to develop a useful tool that uses gesture recognition for reducing the communication barrier between the deaf and dumb community and the normal people. This project was meant to be a prototype for checking the feasibility of recognizing gestures using image processing. Using the designed project it is possible to convert hand gestures into speech which can be understood easily by normal people. The idea of the proposed system has greater possibilities of future expansions. If more programming logic is introduced, more number of gestures could be incorporated. It could be developed into a multilingual speech enable system. Gesture control robot could be developed using the same thought. Gesture based smart devices such as HD TV and smartphone can also be developed. The same system can be modified for easier interaction of blind people with outside world

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