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Speaking System for Mute People Using Raspberry-PI

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Abstract:- Communication between mute and a normal person have always been a difficult task. Manufacturers around the world have formulated various sign language systems but they are not adaptable and cost-effective for all the people. By using hand motions and gestures we put forth a smart speaking system which will help deaf people to communicate with normal people. The system is provided with sensors like motion and flex consisting of hand motion reading system in addition with a unit of speaker.

In this project the hand gesture which is also known as sign language will be converted into voice for mute people. During emergency, a mute person who is travelling amongst new people and if he/she wants to communicate with them becomes a difficult task. For the operation of the system and processing the data raspberry pi is used. Battery powered circuit is used to power the system and to run it. The system incorporates a text to speech conversion block that interrupts the signs that match i.e. text to speech out. The system consists of data base and many more which helps the mute people to convey primary messages. And this makes sure that the system does not speak. For the set of sensor values it searches for the matching messages. Once the message is found in memory it is recovered through the interfaced speaker and is spoken out.

Keywords:- *Raspberry Pi, Smart speaking systems, Flex sensors.*

I. INTRODUCTION

In the whole world approximately about nine thousand million people are mute (deaf). How frequently will we come across the mute people communicating with the normal people? On comparison of communication between the blind and a normal sight person, the communication between a deaf and normal person is a serious problem. Amongst the deaf people in world, sign language is a non-verbal form of intercommunication. This sign language doesn't have a common origin and hence it is difficult to understand and translate for normal people. A device that translates the sign language to hand gestures is a mute communication interpreter. As hand sign language will not be trained by regular people, the communication between the deaf people and regular people becomes very difficult. During emergency, a mute person who is travelling amongst new people and if he/she wants to communicate with them becomes a difficult task. For the operation of the system and processing the data raspberry pi is used. Battery powered circuit is used to power the system and to run it. The system comprises of about stored 10 messages which will help deaf people to communicate their primary messages like "need help", "Where is the particular address located?" and so on. For different variations of hand movement the system reads persons hand motions. The system consists of trigger sensor, which helps in automatically activating the system whenever the person wants to speak something. Whenever the mute person makes hand motions just impulsively, the system ensures that it does not speak. The brain of the system i.e. raspberry pi processor processes the input sensor values which are constantly received. Now for the set of received sensor values messages are matched. From memory the message is retrieved once it is found, and through the speaker it is spoken out using text to speech process. Thus a smart speaking system which is fully functional is useful which helps deaf people convey their messages with normal people using wearable system.

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II. RELATED WORK

Firstly, in paper American Sign Language Interpreter by Kunal Kadam, Rucha Ganu, Ankita Bhosekar, Prof. S. D. Joshi [1] states that, the mute person will ho through the complete sentence which he wants to communicate with others. Then the sentence read by the person will be able to translate it into speech, which will be understood audible to everyone.

In paper signal processing robotics by Ata-Ur-Rehman, Salman Afghani, Muhammed Akmal and Raheel Yousaf [2] states that, a scheme using a database-driven hand gesture recognition based upon skin color model approach and thresholding approach along with an effective template matching with can be effectively used for human robotics applications and similar other applications.. Initially, hand region segmented by applying skin color model in YCbCr color space. In the next stage thresholding is applied to separate foreground and background. Finally, for recognition Principal Component Analysis is used for template based matching.

In paper Pakistan Sign Language Recognition Using Statistical Template Matching by Aleem Khalid Alvi, M Yousuf Bin Azhar, Mehmood Usman, Suleman Mumtaz, Sameer Rafiq,et al [3] states that, using digital image processing the static hand gesture recognition system. SIFT algorithm is used for hand gesture feature sector. The SIFT features have been computed at the edges which are invariant to scaling, rotation in addition to noise.

In paper a new instrumented approach for translating American Sign Language into sound and text by Hernandez-Rebollar, J. L.; Kyriakopoulos, N. ; Lindeman [4] states that, an approach for capturing and translating isolated gestures of American Sign Language into spoken and written words. The instrumented part of the system combines an AcceleGlove and a two-link arm skeleton. Gestures of the American Sign Language are broken down into unique sequences of phonemes called poses and movements, recognized by software modules trained and tested independently on volunteers with different hand sizes and signing ability. The system proved to be scalable: when the lexicon was extended to 176 signs and tested without retraining, the accuracy was 95%. This represents an improvement over classification based on hidden Markov models (HMMs) and neural networks (NNs).

In paper Sign language recognition using sensor gloves by Mehdi, S.A.; Khan, Y. N. [5] States that, finger of the mute person will be placed with particular action in front of the flex sensor .When the gestures are made by the person, the exact positions of the fingers will be captured and image processing using principle component analysis algorithm will be performed. The captured images will be mapped with the one previously stored and accordingly exact phase angle from the database will be identified.

III. METHODOLOGY

The System Architecture of the proposed speaking system for deaf people using raspberry pi is as shown in the fig 1. It consists of Raspberry Pi controller board, LCD display, speaker, flex sensor and accelmelator.

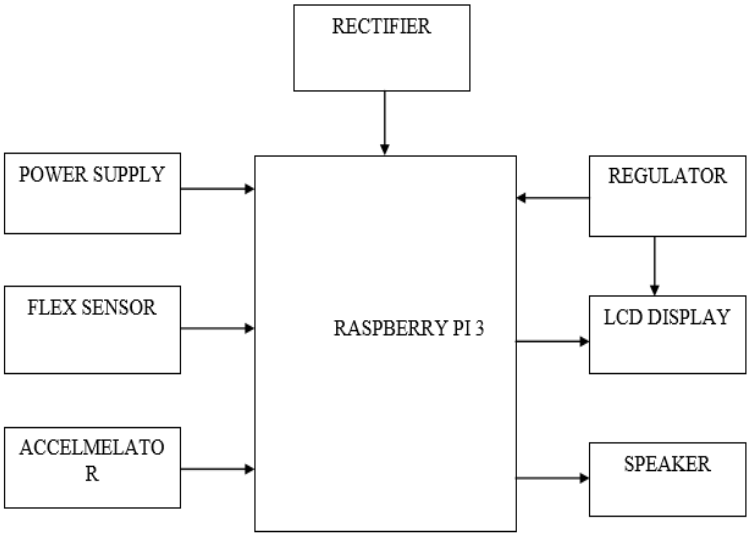

Fig 1:- System Architecture

Here flex sensors are used to detect hand posture. Flex sensors are carbon resistive elements. When the sensor is bent, corresponding to the bend radius it produces the output resistance. Approximately from 10K to 30K ohm the resistance value is varied. When sensor is bent at 90 degree the resistance increases to 30K ohm and an unfixed sensor resistance is decreased to 10K ohm. The sensor is about 4-1/2 inches long and ¼ inch wide,. The five flex sensors are set up on the five fingers of the user. When user makes a hand gesture to express a specific word the flex sensors gets folded. As the posture of each finger is different, so resistance value of each flex sensor is also different.

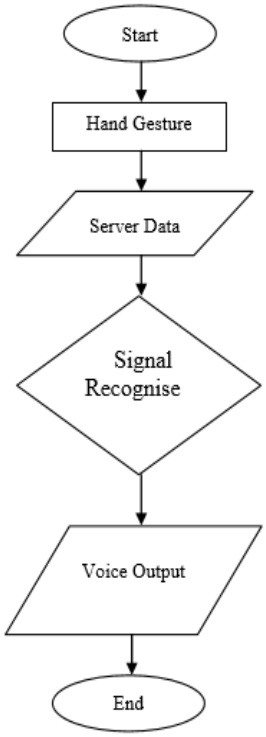

Fig 2:- Data flow diagram

IV. WORKING

In this system, it reads person's hand motion for various hand movements. It senses the motion of the hand using flex sensors. To get the right information from the user a sign language is pre-defined in the Raspberry pi. For each gesture movement it is given by flex sensors in a glove is processed and has pre-defined functions in the system code and it looks for the messages which are matching for the set of flex sensor value. These messages are retrieved from the processor and sent to the audio driver of the raspberry pi and use a speaker that is interfaced with the processor. This can be done by using image processing using the camera module. The gestures are captured by the processor and the search for the matching message according to the processed gesture.

Grayscale conversion: In digital photography, image generated in computer and colorimeter, the value of each pixel is a single sample of a grayscale image representing an amount of light, i.e. carries information of intensity. To perform a threshold on the image, grayscale conversion is done after smoothenig the image. There are three planes in an each pixel of RGB image which are red, green and blue planes. In 24-bit pixel, one plane represents 8-bit that carries the R, G, B values in pixel. After the completion of grayscale conversion, the value of the pixel gets converted to a value of 8-bit and finally carries only the information of intensity.

Thresholding: After the grayscale conversion, thresholding technique is performed. Thresholding is a technique where if the image intensity is less than some fixed constant it restores every pixel in an image with a black pixel or if the image intensity is greater than that constant by white pixel. It is performed detect the objects from the background and separate them from the foreground.

Feature Extraction: After the completion of thresholding technique, the shape of the object by using the edge detection algorithm. One of the primary features for description of image content is detection of the shape of the object which is an important visual feature. Region-based and contour-based methods are the two main categories of the shape descriptors. In region-based method, the whole area of an object is used for shape description while in contour-based method; only the information present in the contour of an object is used. For edge detection and feature extraction the canny edge detector is used.

V. CONCLUSION

In this project work, the sign language will be more helpful for the ease of communication between the mute people and normal people. The project mainly aims at reducing the gap of communication between the mute people and normal people. Here the methodology intercepts the mute signs into speech. In this system it overcomes the difficulties faced by mute people and helps them in improving their manner. The projected system is very easy to carry to any places when compared to existing systems.

To help the mute people, the language gets converted into text kind and on the digital display screen it will be displayed. Who cannot communicate with normal people i.e. deaf and dumb people the system is very much helpful. The primary feature of the project is the one which will be applied in common places that the recognizer of the gestures may be a standalone system.

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