SPEAKING SYSTEM FOR MUTE PEOPLE USING RASPBERRY PI

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Abstract : It's very difficult for mute people to convey their message to regular people. Since regular people are not trained on hand sign language, the communication becomes very difficult. In emergency or other times when a mute person travelling or among new people communication with nearby people or conveying a message becomes very difficult. Here we propose a smart speaking system that helps mute people in conveying their message to regular people using hand motions and gestures. The system makes use of a hand motion reading system equipped with motion and flex sensors along with a speaker unit. This system is powered by a battery powered circuitry to run it. A raspberry pi is used for processing the data and operating the system. The system consists of around 8 stored messages, "where is the toilet/washroom" and so on that help mute people convey basic messages. The system reads persons' hand motions for different variations of hand movement. Thus we have a fully functional smart speaking system to help mute people communicate with regular people using a simple wearable system**.**

IndexTerms **- Flex sensor, accelerometer, Playback module, Microcontroller, Pi**

I. INTRODUCTION

Overview

The need of this system is to give output in day to day life for "Image Processing Based Sign to Speech Converter for Dumb People" using PCA algorithm. 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.**[4]** 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 and would be beneficial as they can communicate with everyone. In our system a webcam is placed in front of the physically impaired person.**[5]** The physically impaired person will place a finger with particular action in front of the flex sensor .When he makes the gestures, the sensor will capture the exact positions of the fingers and perform image processing using principle component analysis algorithm. The co-ordinates captured will be mapped with the one previously stored and accordingly exact phase angle from the database will be identified. **[6]**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. **[7]**By using this system the physically impaired people would be benefited as they can communicate with everyone freely which indeed would be great achievement for the mankind.

Objective

The great challenge lies in developing an economically feasible and hardware independent system so that physically impaired people can communicate easily.

- Datasheet of all the hand gestures will be made beforehand.
- Then, using matlab programing the real time picture of sign will be captured and will be compared with the datasheet. (phase angle captured will be converted into binary image)
- Then Matlab will give the output to the PI and that output will be in accordance with the matched phase angle.
- Then from the PI, this output will be given to the APR circuit which has 5 inputs.
- All the 5 inputs will be having a different message stored.
- Then in accordance with the output received by the PI, respective message will be played.
- At the end there is an amplifier that is being used to amplify the message
- There is a speaker through which message can be easily heard

Advantages

- Low cost
- Compact systems
- Flexible to users
- It takes less power to operate system

Applications

- Gesture recognition and conversion.
- As a translating device for Mute people.
- It can be used for Mobiles for SMS sending.
- Translation of sign language in many regional languages.

II. EARLIER WORKS

Ibrahim Patel And Dr. Y. Srinivas Rao 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 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.

III. MATERIALS AND METHODS

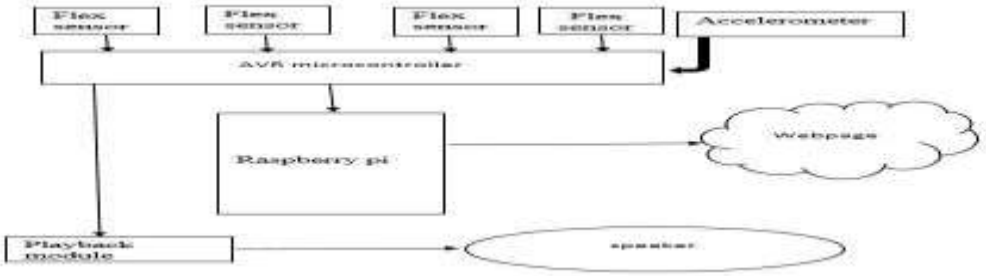
Raspberry pi 3 model B

The Raspberry Pi is a series of small single board computers developed in the United Kingdom by the Raspberry pi foundation to promote the teaching of basic computer science in schools and in developing countries. A Raspberry Pi is a credit card-sized computer originally designed for education, inspired by the 1981 BBC Micro. Creator Eben Upton' s goal was to create a low-cost device that would improve programming skills and hardware understanding at the pre-university level. But thanks to its small size and accessible price, it was quickly adopted by tinkerers, makers.etc.

Digital Voice Processor Using Apr 9600.

Digital voice recording chips with different features and coding technology for speech compression and processing are available on the market from a number of semiconductor manufacture.**[11]** APR 9600 single chip voice recorder and playback device from A plus integrated circuits makes use of a proprietary analogue storage technique implemented using flash non-volatile memory process in which each cell is capable of storing up to 256 voltage levels.

Speaker: For audio amplification and audio output



As shown in figure, Flex sensors are used to detect hand posture. Flex sensors are resistive carbon elements. . flex sensors area unit accustomed measure the degree of bending of the fingers. The flex sensors interface with the controller. The measuring instrument is directly interfaced to the digital ports because it includes the signal acquisition circuit. The device contains these sensors for coaching mode and word formations. This can be interfaced with the digital ports of controller to enclose the digital information. In coaching mode the gesture is formed by the user and also the voltage levels area units keep in EEPROM. In operational mode the information is being compared with predefined values and also the matched gestures area unit sent with text to speech conversion module.

Data glove consists of 2 detectors; flex sensors and measuring device sensor. The output of the measuring device sensors is detected by the lean detection module, whereas the output of the flex sensors and therefore the overall gesture of the hand square measure detected by the gesture detection module . The gesture detection module provides associate degree 8-bit address for speech synthesis module; 8-bit address is completely different for every gesture. Speech Synthesis module speaks the message severally to deal with received by it.

Flex sensors are resistive carbon parts. When bent, the device develops a resistance output correlative to the bend radius. The variation in resistance is just about 10kΩ to 30kΩ. A global organization flexed device has 10kΩ resistance and once bent the resistance will increase to 30kΩ at 90o. The device incorporates within the device employing a potential divider network. The potential divider is employed to line the output voltage across 2 resistors connected nonparallel as shown in Figure 2. The electrical

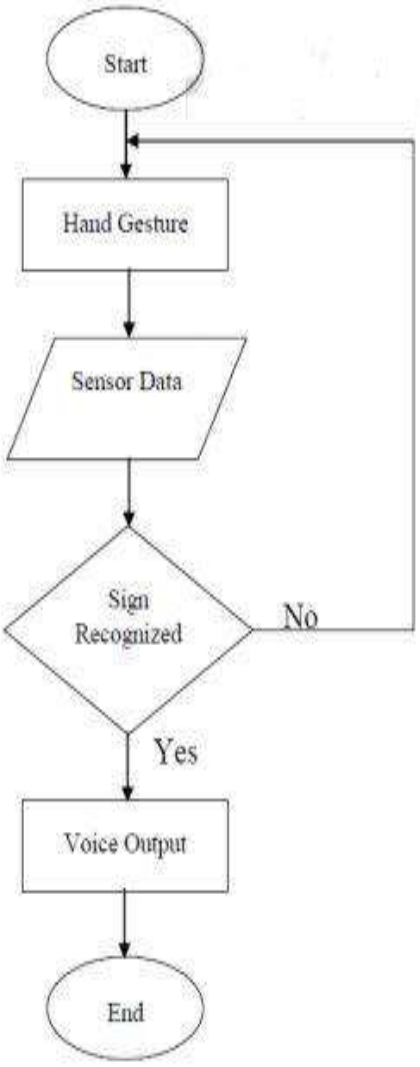
device and flex forms a potential divider that divides the input voltage by a quantitative relation determined by the variable and glued resistors.

Accelerometer within the Gesture Vocalized system is employed as a tilt sensing element, which checks the tilting of the hand. ADXL103 measuring system as shown . The tip product of the measuring system is provided to 3rd module, which incorporates pipeline structure of 2 ADC. There's a technical issue at this stage of the project that the analog output of the measuring system as shown.

IV. PROPOSED METHODOLOGY

For implementation of this system we require different hand gestures and web camera is required for capturing the gestures. The person would be placing different gestures in front of the camera. When the user makes the gesture of a symbol while implementing system there are different modules involve in the system are as follows:

System flow chart



1. **Generation of Database** : First of all while processing the images, it is necessary to prepare a proper database of 5 images of each symbol total of 40 images are captured in order to increase the accuracy for identification of images.

2. **Image pre-processing and segmentation:** Preprocessing consists of image acquisition, segmentation and morphological filtering methods. Then the Segmentation of hands is carried out to separate object and the background. PCA algorithm is used for segmentation purpose. The segmented hand image is represented certain features. These features are further used for gesture recognition Morphological filtering techniques are used to remove noises from images so that we can get a smooth contour.
3. **Feature extraction: It** is a method of reducing data dimensionality by encoding related information in a compressed representation. The selection of which features to deal with are centroid, skin colour and principle component analysis as the main features.
4. **Sign Recognition:** It uses principle component algorithm analysis to identify the image from the database.

The PCA algorithm involves 2 phases:

- Training phase
- Recognition phase

In training mode, each gesture is represented as a column vector. Then PCA finds the eigen vectors of the covariance matrix of gestures and then they are multiplied by each of their gesture vectors to obtain their gesture space projections.

In the recognition phase, a subjected gesture is projected onto gesture space and the euclidean distance is computed between this projection and all known projections.

5. **Sign to voice conversion-** The identified image is converted into voice or speech signal using APR 9600 and speaker.

Output Matching w.r.t. Input Database

V. RESULTS AND CONCLUSION

This paper proposes an electronic design that can be used for communication between deaf, mute people and normal people.

The following remarks could be the summary of the findings from this work.

- The design is more compatible and faster responsive when compared to existing design using PCA algorithm
- A responsive time of 2 to 3 seconds.
- More Compact and portable.
- Efficient communication between differently abled (deaf in this context) and normal people.
- Assign language involves different gestures and hand movement, improves small motor skills of differently abled people.
- A mobile application can be built for the efficient use of the design and to make it user-friendly.

Proposed hardware

CONCLUSION

The proposed method is tested on different gestures. It produces 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 dumb 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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