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Hand Gesture Speaking Unit for Mute People

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Abstract—The primary aim of this paper is to efficiently act as a substitution of voice and ear by translating gestures performed by hand to the corresponding text which can be understood by any person who can read. The purpose of this research is to analyze and evaluate how the device can reduce the difficulty in Communication among people having listening and speech disability and find out the limitations of the device in comparison to the other technologies and devices working towards the similar objective. Their communications with others only involve the use of motion by their hands and expressions. We have designed a technique called artificial speaking mouth for dumb people. It will be very helpful for them to convey their thoughts to others. For mute people, there is a meaning behind every motion this message is kept in a database. So when the information generated by the flex sensors as per the gesture is being fed to the microcontroller. Microcontroller Atmega 328 matches the gesture data with the data in the database and the relevant gesture name is determined from the output.

Keywords— artificial speaking mouth, Atmega 328, Microcontroller

I. INTRODUCTION

In our day to day life we often encounter many people who are differently abled in terms of armless, deaf, lame, blind, paralyzed etc. Due to their inability to perform many basic task which a normal person can do easily, living the life could be a bit easy. Researches the design and use of computer technology, focused on the interfaces between people. Human Computer Interaction(HCI)[1] is the design and use of computer technology, based on the interfaces between people and computers leading to constructive integration in medical science and engineering[2]. These can provide input to the computer that is the position and rotation of the hands using sensors besides, some gloves can even detect finger bending with a high degree of accuracy (5-10 degrees)[3].The purpose of this paper is to facilitate the communication for a mute person and should be easy to use .This paper comprises of

I INTRODUCTION
II RELATED WORK
III EQUATION
IV COMPONENTS
V METHODOLOGY
VI RESULTS

II. RELATED WORK

Prof. A.H.Ansari[4] , designed a device that involves the use of flex sensors which are resistive elements having variable resistance within the range of 10 to 30 k ohm when in the unfixed mode it delivers a resistance of 10 k ohm and when bent to an angle of approximately 90 degrees it delivers the resistance of 30 k ohm. When a gesture is made through these five flex sensors each flex sensors would have different resistance values due to different bending of each individual figure. Then these values from the flex sensors are being given as the input to the inbuilt ADC of the microcontroller (ARM7) and the microcontroller will try to match these values with the values which are previously stored in the look-up table stored in the program memory of the microcontroller. Additionally, the microcontroller has also stored up the voice file in its SD card memory, each voice file corresponds to the gestures stored in the lookup table.

Garima Rao[5], presented the PIC microcontroller 16f887 with 16×2 LCD display and apr9600. This paper also has a similar methodology as the previous citation the analog input of the flex sensor is being converted to digital through PIC microcontroller having 10 ADC channels.

S. k imam Basha[6,], Kavitha Sooda[7], designed the device which acquires images through the webcam and processed through Matlab software. It involved certain steps such as image acquisition to reduce noise and feature extraction. Here feature extraction involves detecting the shape of the object whose image is being taken through edge detection algorithm. Template matching is being done to match the acquired image with the image stored in the database. Here the processor used is ARM7 processor where the unique code corresponding to each gesture is matched with a lookup table and corresponding voice file is played.

V.Padmanabhan[8], in addition to using the flex sensors they also used the accelerometer which is a tilt sensor .so besides just detecting finger posture the accelerometer placed also detects the hand movement which ensures more accuracy and more number of gesture to be recognized.

III. EQUATION

This is voltage divider rule equation in which the input voltage given to the flex sensor is divided as per the bend experienced by the flex sensor.

$$R_2/(R_2+R_1) * V_{in} = V_{out} \quad (1)$$

R_2 , R_1=resistors of flex sensor
V_{in} = input voltage
V_{out} = output voltage

IV. COMPONENTS

IV.I.**Flex sensor**: Flex sensor (Fig 1) is a sensor that measures the amount bending. The resistor of the sensor element is. varied by bending the strip of the sensor, as resistance is dependent on the amount of bending it is also called a flexible potentiometer. It has nominal resistance (resistance at the flat position) of 25 kilo-ohms with resistance tolerance of +/- 30%. It has resistance achieved during bending at a different angle in the range of 45 kilo-ohms to 125 kilo-ohms.

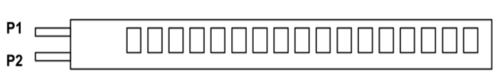

Fig 1: flex sensor

IV.II. **HC-05 Bluetooth Module**: The HC-05 (Fig 2) is a bluetooth module that provide two-way/duplex wireless functionality to the host device. The module communicate with the help of USART of 9600 baud rate so this is being used as Arduino supports USART functionality. The HC-05 operates in two modes one is data mode which involves sending and receiving data from other bluetooth devices, another is command mode where the device settings can be changed.

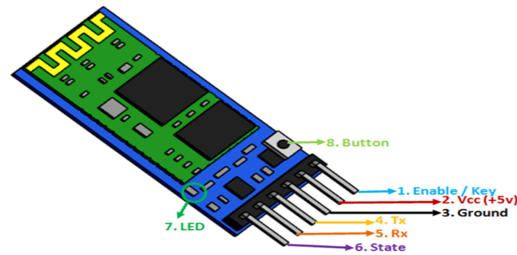

Fig 2: HC-05 bluetooth module

IV.III. **Atmega 328**: Atmega 328 (Fig 3)single chip 8 bit AVR RISC based microcontroller having 23 general purpose I/O lines, 1 kB EEPROM and 2kB SRAM, serial programmable USART and 6 channel 10 bit A/D convertor. It operates from 1.8 to 5.5 volts.

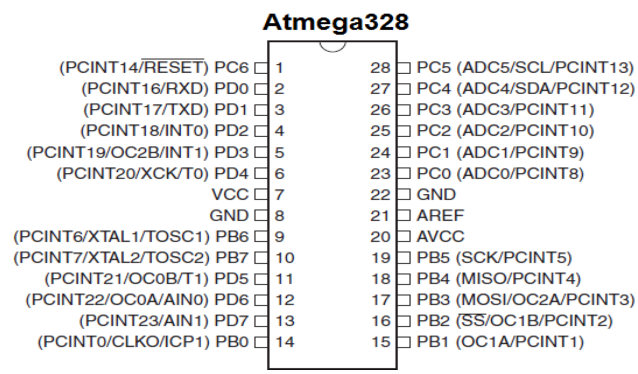

Fig 3:Atmega 328 pin diagram

V. METHODOLOGY

In this paper (Fig 4) flex sensors are being used where each flex sensor is attached in the fingers of the glove being used and the system is mounted on the back palm side of the glove. Each flex sensor converts the degree of bent to an electric signal to the ADC (analog to digital converter) of the Atmega 328 microcontroller. (Fig 5) The first phase it involves is the calibration mode, in calibration mode, the microcontroller fetches the initial values for the calibration purpose. These calibrated values get stored in variables a, b, c, d, e. Then the second phase is gesture recognition phase, in this phase, the current values being fetched from the flex sensor is compared with the calibrated values. We have programmed the device to recognize 5 most common gesture that is I am hungry, I am sick, I am feeling thirsty, refusal and acceptance. For each gesture mentioned the input is being taken from each flex sensors and for each gesture, there is some range of values programmed in the microcontroller. Under these ranges, we have demonstrated experimental results on the desired gesture which would be considered valid.

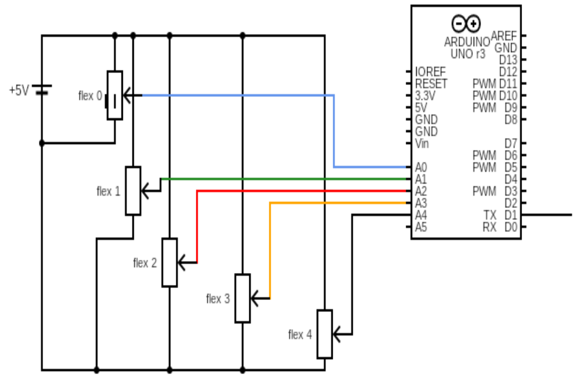

Fig 4: Circuit diagram

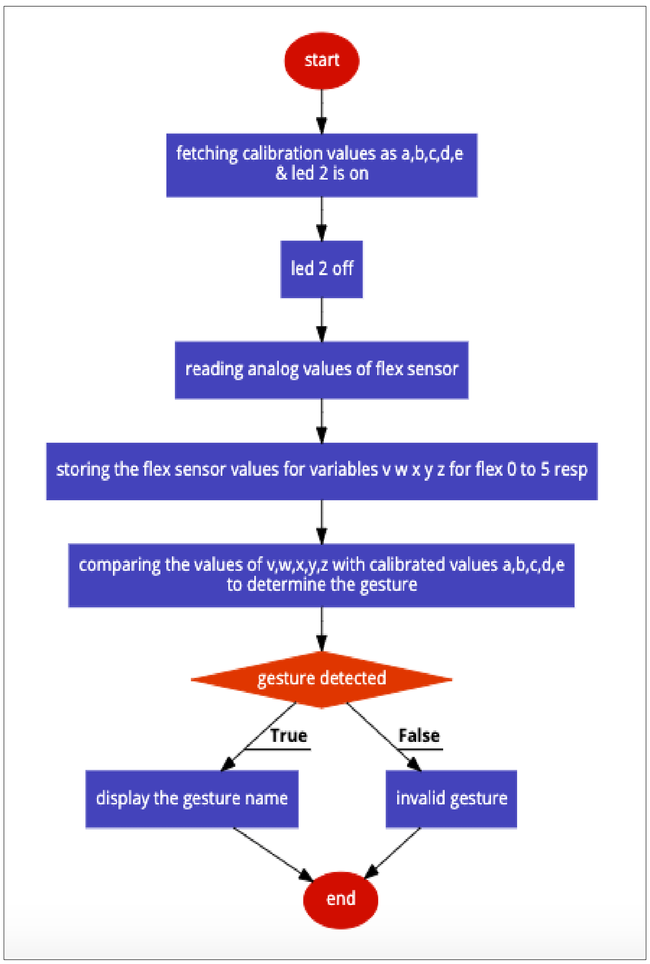

Fig 5:Flow chart

VI. RESULTS

An android app is designed which receives the data sent by Bluetooth module and it also consists of text to speech converter which displays the gesture name on mobile screen as well as plays the audio clip that determines what a gesture is indicating to. Screenshot of the app is mentioned in figure down below

Fig 6 :android application screen shot and gesture for 'hungry' made through glove

Fig 7: Android application screenshot and gesture for 'hungry' made through glove

Fig.8

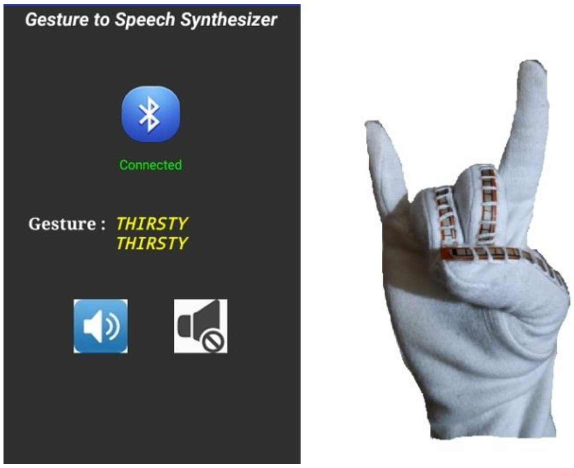

Fig.9

Fig 10 : Gesture for ‘No’

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