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Arduino Based Gestures to Speech Conversion System

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ABSTRACT

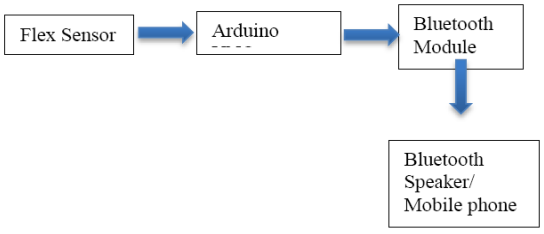
Around 5% of the Indian population has difficulty in speaking or cannot speak. So, sign language is a method of non-verbal communication that is used by deaf and dumb people. Normal people do not learn sign language. The problem arises here and this problem becomes a barrier between them. The past implementation of this project involved using image processing concept and accelerometer. But the drawback of these implementations are projects were non portable and too expensive. In this research paper, we have suggested a wearable glove for people who face difficulty in communicating verbally due to various different reasons (be it deaf or dumb), so that with the possession of this device, they can exhibit their basic requirements via their gestures and those gestures will be converted to speech for the hearer to understand what is he or she trying to say.

Keywords: *Arduino; Bluetooth; Flex Sensor.*

1.0 Introduction

Gesture to Speech Conversion [1-5] is a tool for converting gestures of the differently abled people of the world to speech i.e. converting gestures input to speech outp Gesture to Speech Conversion [1-5] is a tool for converting gestures of the differently abled people of the world to speech i.e. convert gestures input to speech output. Proposed system is portable and focuses on two way communication. Main goal of the system is to convert hand gestures to auditory speech for communication between mute and normal people.

Fig 1: Block Diagram



There are 4 flex sensors that are used. Each flex sensor is connected to different pins of Arduino UNO which is the controlling unit. Now the Tx and Rx pins of Arduino are connected to Rx and Tx pins of the Bluetooth module HC05 respectively. Now, the Bluetooth module is connected to a Bluetooth speaker of an app in mobile phone to give a speech output.

2.0 Components Used

Flex Sensor – A flex sensor is one of a kind of a variable resistor. It measures the amount of deflection or bend. It's a sensor whose output changes when it is bent i.e. as the sensor is flexed, the resistance across the sensor increases and when it come back to the normal position i.e it is straight, it has lesser resistance as compared to the resistance value when it was bent. This change in resistance is one of the key features being used in our project.

The flex sensor has two output wires and the resistance between these two wires varies when the sensor is bent.

Electrical Specifications:

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1. Flat Resistance: 25K Ohms
2. Resistance Tolerance: +-30%
3. Bend Resistance Range: 45K - 125K Ohms (Depending upon bend radius)
4. Power Rating: Continuously 0.50 Watts and 1 Watt Peak.

Working of a Flex Sensor

Fig 2: Flex Sensor

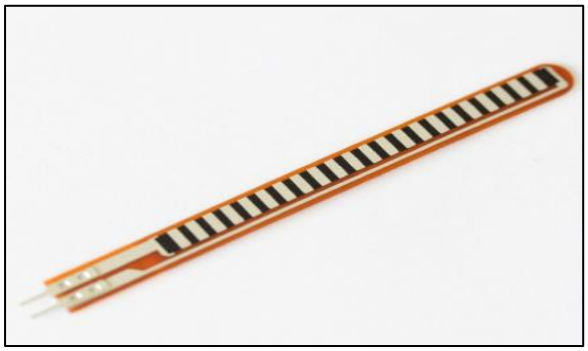
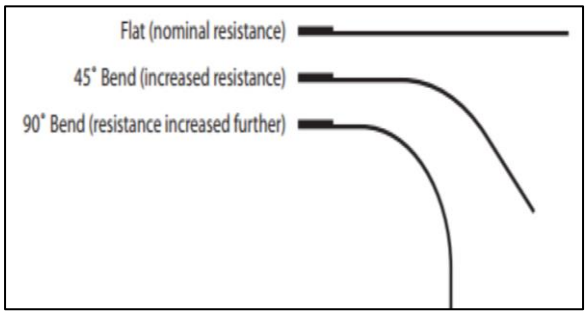
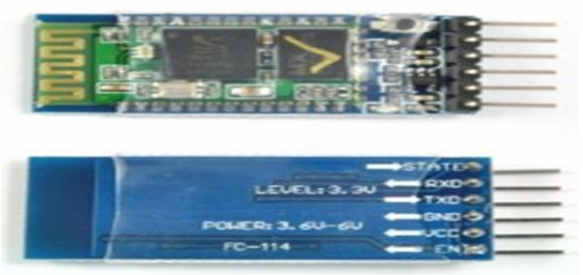


Fig 3: Working of Flex



Bluetooth Module HC -05 – It is a master - slave module. In our glove, Bluetooth module is taking an input from Arduino, then it is acting as a SLAVE unit and when Bluetooth module is giving an input into the speaker or mobile phone, then it is acting as a MASTER unit.

Fig 4: Bluetooth Module Hc05



Features

1. I/O - 3.3 to 5V.
2. PIO (Programmable Input/ Output) control.
3. with integrated antenna and edge connector.

Arduino Uno – We are using Arduino UNO for designing our glove which is a microcontroller board based on the ATmega328P.

It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.

Fig 5: Arduino UNO

Bluetooth Speaker – It is a speaker connected to the Arduino via Bluetooth module and gives the output of the digital signals of the Arduino.

It receives the audio signals using radio frequency (RF) waves rather than over audio cables. Since our project is based to suit a regular use purpose, we can also get the output on our mobile phone by connecting it with HC 05.

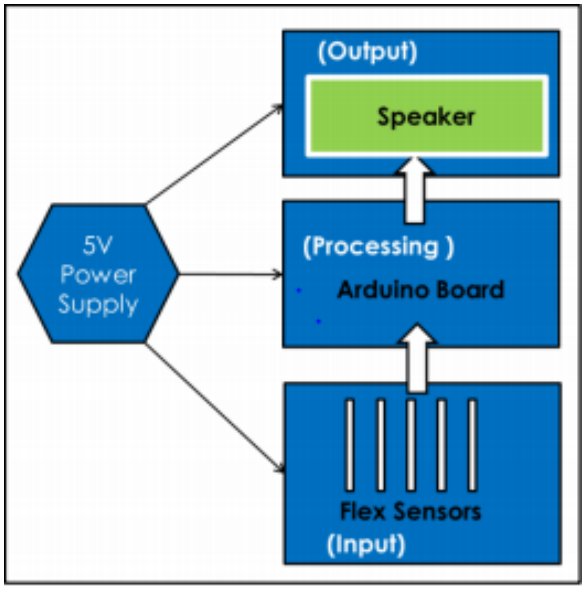
Features

1. Total Power Output: 3W
2. Impedance Satellite: 4 Ohms
3. Signal to Noise Ratio: 76dB
4. Range: 10m
3. Construction

Flex sensors are connected to Arduino Uno analog input pins;

- Arduino is further connected to Bluetooth module HC - 05 by TX and RX pins which gives an input to the Bluetooth speaker;
- Bluetooth speaker/mobile phone gives the output in speech form.

Fig 6: Conceptual View



4.0 Working of Device

The user wears a glove that has flex sensors on it. Now when the user wants to say something, he/she makes gestures by bending the fingers. So, different combinations are made with the bending of the flex sensors creating different resistance combinations for the output pin of the Arduino to exhibit different entity. Arduino is connected to Bluetooth module HC - 05; which is further connected to Bluetooth speaker/mobile phone.

The flex sensor will give input to Arduino with the bending of the fingers of the person resulting in the change of the angles of the flex sensor hence changing the resistance will trigger the Arduino to give the relevant output as per the code we have written i.e. which combination of resistances will give which entity as my output. Further, when I will have the output, the speaker which is connected to the Bluetooth module will give the speech signal as my output.

5.0 Conclusions

Using this glove i.e. which can give a speech output from gestures input will help a lot of people communicating at public places which was a bit difficult earlier for differently abled people like if we say if they required to buy a coffee and for this they had to make the vendor understand via their gestures what they actually want; was a very difficult and time consuming task which will be easily sorted if that person is using this device while asking for a coffee now because with the possession of this glove, his or her gestures will now be converted to speech and the vendor will come to know that the customer is asking for a coffee and so on for other commodities as well.

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