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Arduino and Flex Sensor Based Hand Gesture to Speech Conversion

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ABSTRACT

The people who cannot hear and speak feel difficult to communicate. But these people are able to use the sign language for the communication. So there is a need to express their feelings in a better way using sign language. In this paper a model to convert hand gesture to text in the first part later the text is converted to the speech is proposed. With the usage of microcontroller based boards, flex sensor, Bluetooth modules and text to speech converters the communication can be improved in an effective manner. The proposed model is tested practically whether it is able to identify the different hand gestures and convert to speech. As text to speech conversion process is a preloaded trained program it can be used to convert the gesture text to different languages.

Key words: Arduino Uno R3, Bluetooth module HC-05, Flex sensor, Microcontroller, Signal converter LM358P.

1. INTRODUCTION

Lack of ability to speak is considered a true disability. Sign language a common method used for people with disabilities to commune with others among the different modes of communication available. In sign language by simultaneously combining hand shapes and gestures the meaning is conveyed instead of using sound [1]. Words and sentences are communicated to the audience using signs. A sign language has a sign for whole words. So, the relations between deaf-mute and standard person are invariably a difficult task [2].

Human body language is used in sign language. The meaning of each word can be conveyed by a particular expression. Human signal language is converted to voice with gestures. A small number of systems are available for sign language translation [3]. The proposed system will aid the people with disabilities to communicate with mass crowd gathering by converting the hand gestures to sound. A gesture is relaxed hands movement with definite shape made with them. In this work the gesture is converted to speech for that the Flex sensor plays a key role [4].

We propose a Sign Language Glove. The glove is fixed with flex sensor. In Flex sensor the resistance changes depending on the amount of bend on sensors. It assists the people to interact with gestures. Sign language with single handed person will give signals of alphabets [5]. All gestures made by the user are recorded by the glove. Gestures are translated into visual and auditory form. This model uses the Arduino controller [9]. Organizing all processes with flex sensors will track movement of fingers and also the entire palm. User gestures are displayed on an LCD. Speaker is used to translating the gesture into an audio signal [6].

The glove within equipped with flex sensor. The flex sensor resistance change with respect to the flexion movement [7]. For every precise gesture, a flex detector gives relative adjustment in resistance and measures inclination of the hand. Each gesture having some different indication of signals which appeared as in the form of output [8].

The procedure of gestures is programmed in microcontroller. Using this device deaf and standard person could communicate each other in a convenient way. Sign language helps the dumb and deaf people to interact with rest of the world. Common people interaction with blind people is tough because of interaction problem. In order to reduce the problem speech to sign technology is used for language translation on smart phones.

Many applications are existing in the market to assist the blind people to interact with the normal people. This effort consists of voice based and text based contact approach. The objective is to express sign language to text/speech. The framework provides a helping hand for speech impaired person for communicating with rest of world using this sign language. The main aspect of

this paper is, it can be used to understand sign language. The middle person who acts as a medium of translation can be eliminated by providing speech/text output for a sign gesture input.

2. HARDWARE DESCRIPTION

The following components are used for implementing the model.

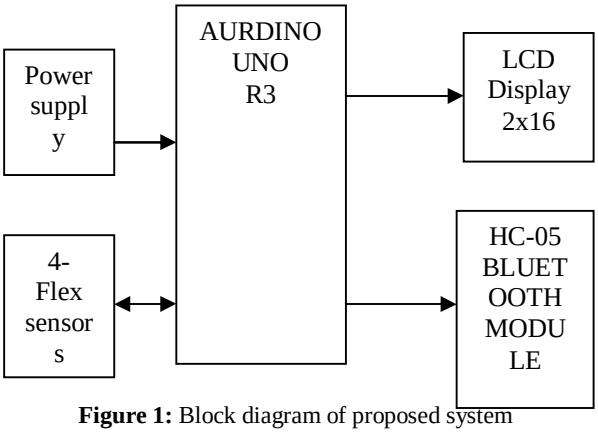

Figure 1: Block diagram of proposed system

Heat flex sensor is a type of transducer that delivers electrical signal relative to the total applied heat rate. The ratio of heat rate to surface area of sensor determines the heat flex. Resistance of flex sensor changes only in one direction. It is made up of plastic and carbon. For not flexed sensor the resistance level is low and for the flexed sensor the resistance level is high. The sensor resistance changes depending on angle bend of the sensor fixed on the hand glove fingers. The change in resistance is converted to corresponding voltage.

2.1 Arduino Board

The Arduino board have total 14 digital input and output pins. It is supported by a micro controller. It has 6 PWM output, six analog pins, universal serial bus connection, reset button, crystal oscillator and ICSP header. The power required for the Arduino board is taken from the USB or external power supply.

2.2 Bluetooth Module

HC-05 have total 6 pins out of which four pins are used as voltage common collector, ground, transmit data and receive data. Remaining pins use as key and state pins for the work. The supply voltage required for the voltage common collector is 5 volt and receive data pin is interfaced with the Arduino for a voltage range of 3.3 volts. This tool is used for wireless interaction of up to 10 metres. A voltage divider and resistor are used to protect the Arduino board from the quick damage. The Arduino board pins of 8, 9, and 10 are connected to three LED's.8

2.3 External power supply to the circuit

We need an external DC power supply of voltage 7 V to 12 V. This DC supply can be obtained from an adapter which converts the AC supply from the mains to DC of required voltage levels.

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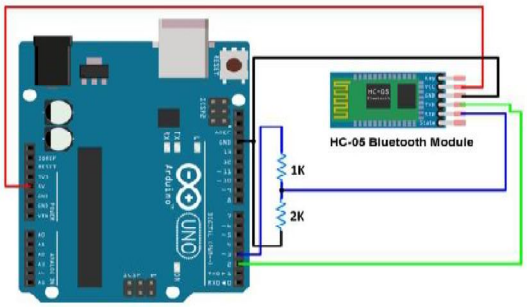

Figure 2: Arduino and Bluetooth interfacing

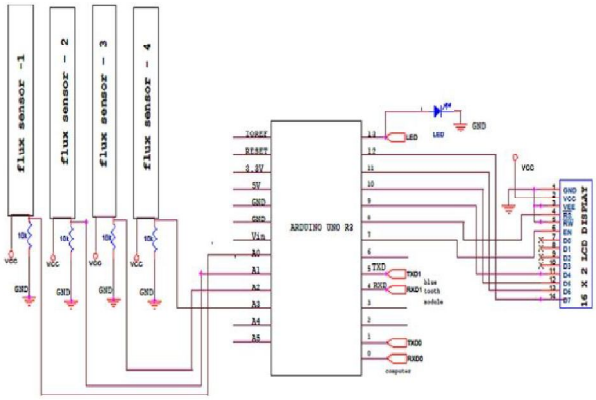

Figure 3: Implemented block diagram of proposed system

3. FLOW CHART FOR HAND GESTURE TO SPEECH CONVERSION

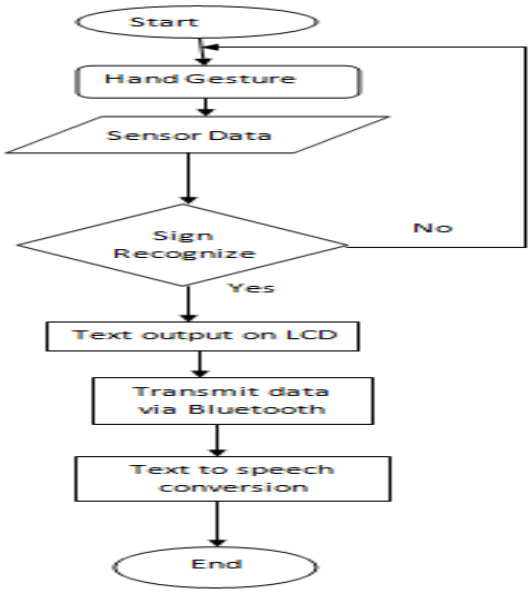

Figure 4: Flow Chart for hand gesture to speech conversion

Figure 4 shows the flow of algorithm used in system. Sensors are fixed on hand gloves. Four fingers are used for this purpose. Each sensor is fixed on one finger. Based on the gesture made by the person with the help of gloves the hand gesture is identified by the sensor. If sign is recognized then data will be sent to be displayed as text on LCD. If the sign is not recognized then go to start. Again one more gesture is made; the process is repeated until the hand gesture is identified. Now the text displayed on the LCD is transmitted via Bluetooth. The transmitted data from the Bluetooth is converted to speech. Once it is converted to speech which is understandable to normal person then the process is stopped.

4. RESULTS AND DISCUSSION

In this model, power supply is given to the flex sensors through LM7805 which gives maximum five volt. Here 10 k ohm's resistor is in parallel with flex sensor which again has the resistance of 10 k ohm. On bending it changes its resistance. It has LEDs which is in parallel to voice processor and in series with LCD so that we get to know that board is taking response or not. Now, in Arduino have an inbuilt ADC which is directly connected to flex sensor. This LCD is wired to digital pins of Arduino Uno R3 and voice processor connected to analog pin of the Arduino. It has a RESET button which is only used to execute the program from the starting. There is Bluetooth module which is connected to the Arduino. It plays the recorded voice corresponding to the code given to the Arduino. Figure 5 represents the implementation of the proposed model on the bread board. Figure 6 shows that the identified gesture is 'COFFEE' and displays the message on LCD. Similarly Figure 7 and 8 conveys that the identified gesture is 'FOOD' and 'NORMAL' respectively and displays the same on LCD.

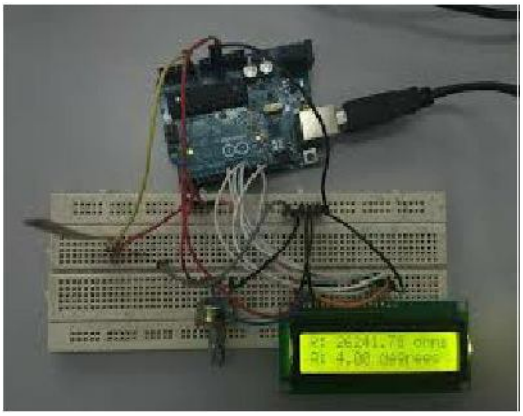

Figure 5: Bread Board Connection

Figure 6: Recognizing the gesture and playing the code as "COFFEE"

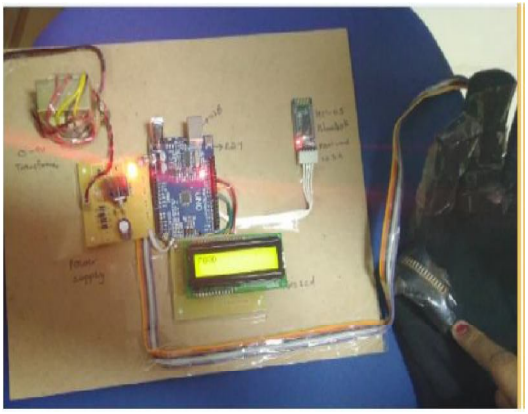

Figure 7: Recognizing the gesture and playing the code as "FOOD"

Figure 8: Recognizing the gesture and playing the code as "NORMAL"

5. CONCLUSION

Using sign language the interaction between deaf, mute and normal person is improved. For the people who are paralyzed, unable to talk and hear this model makes communication easy. The proposed block diagram is implemented using flex sensor, Arduino board, blue tooth module and various hard ware

components. The proposed model is tested practically. It is able to sense the gestures and display on LCD. Text output on LCD is then converted to speech in effective way.

REFERENCES

1. Fauzan Khan, Akshata Surve , Faiz Shaikh , Prof. Amjed Ali. **Sign Language Glove using Arduino**, *International Journal for Research in Applied Science & Engineering Technology*. Volume 5 Issue 3, March 2017.
2. P. Jahnavi, Dr. E. Vamsidhar, Dr. C. Karthikeyan. **Facial expression detection of all emotions and face recognition system.** *International Journal of Emerging Trends in Engineering Research* Volume 7, No. 12 December 2019 pp 778-783
3. V. Padmanabhn M. Somalatha. **Hand gesture recognition and voice conversion system for mute people**. *International Journal of Scientific & Engineering Research*, Volume 5, Issue 5, May-2014.
4. Kirsten Ellis and Jan Carlo Barca. **Exploring Sensor Gloves for Teaching Children Sign Language**. *Advances in Human-Computer Interaction*. Pp1-8, 2012.
5. Yun Li, Xiang Chen et al, **Sign-Component-Based Framework for Chinese Sign Language Recognition Using Accelerometer and sEMGData**, *IEEE Transactions On Biomedical Engineering*, VOL. 59, NO. 10, pp. 2695- 2704, 2012.
6. Shital P.Dawane, Prof. Hajiali G.Sayyed. **A Review on Hand Gesture Recognition for Deaf and Dumb People Using GSM Module**, *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering* Vol. 5, Issue 11, November 2016.
7. M. S Kasar, Anvita Deshmukh, Akshada Gavande, and Priyanka Ghadage, **Smart Speaking GloveVirtual tongue for Deaf and Dumb**, *Internaltional Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*, vol. 5, no. 3, p. 7, Mar. 2016.
8. Starner**, T., Weaver, J., Pentland, A. Real-Time American Sign Language Recognition using Desk and Wearable Computer Based Video**, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 20, No. 12. 1998.
9. B.Mohan, M.V.Ramesh, Melimi Ravi Kumar T.SrinivasaRao P. Muthukumar **Dual Axis Solar Tracking System with LDR** *International Journal of Emerging Trends in Engineering Research* Volume 8, No. 8 August pp 4492-4495