Multipurpose Smart Glove for Deaf and Dumb People

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Abstract - *Communication is the only way by which we are able to express our thoughts among the peoples. Normal people can convey their thoughts effectively by establishing the conversation between them. But in our society there are lot of people who are physically disable that means (deaf and dumb) are not able to communicate effectively. Because of this their disability they are not able to stand in race with the normal people. Some of the people have problem regarding hearing and some are not able to talk so they lag behind the normal people. Generally this people uses the sign language for the communication but they find some problem in communication with those are not able to understand sign language. So their is problem between normal people and physically disable people. This system has main purpose to reduce the communication gap between two communities. The main aim of our proposed project is to developed the cost effective system where disable people can communicate with normal people by using hand glove. This means that communication is not barrier between two communities by using smart glove. So disable can also able to grow in their respective field. Using such system by disable people can make nation grow.*

Key Words: ***Gesture Recognition, Sign Language, Flex Sensors***

1. INTRODUCTION

India constitutes 2.4 million of Deaf and Dumb population, which holds the world's 20% of the Deaf and Dumb Population. This person lacks the amenities which a normal person should own. The big reason behind this is lack of communication as deaf people are unable to listen and dumb people are unable to speak. Fig. 1 shows a survey analysis.
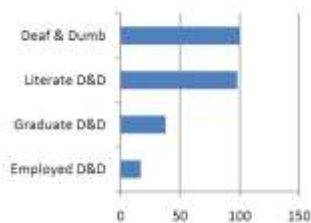

Fig. 1: Deaf and Dumb Work Survey

This decreasing ratio of Literate and Employed Deaf and Dumb population is a result of the physical disability of hearing for deaf people and disability of speaking for dumb People so it yields to lack of communication between normal person and Deaf and Dumb Person. It actually becomes the same problem of two persons which knows two different language, no one of them knows any common language so its becomes a problem to talk with each other and so they requires a translator physically which may not be always convenient to arrange and this same kind of problem occurs in between the Normal Person and the Deaf person or the Normal Person and the Dumb person. To overcome this problem, we introduce a unique application. Our application model is a desirable Interpreter which translates. Natural English Sentences as, an text input by Normal Person for Deaf Person and Sign Language, in form of Gesture by a Dumb Person to Synthesized English Words which have a corresponding meaning in Sign Language which interprets a particular thing, as an Audio Output for Normal Person. This will help Normal and Deaf and dumb communities by removing the communication gap between them. The sign language is an important and only method of communication for deaf-dumb persons. As sign language is a formal language employing a system of hand gesture for communication (by the deaf). In this project Flex Sensor Plays the major role, which are placed on fingers, as fingers bends it changes resistance depending on the amount of bend on the sensor.

2. METHODOLOGY

Proposed system primarily consist of two sections:

 1. Transmitter section

 2. Receiver section

Blocks contained in the transmitter section are

1. Flex sensor

2. PIC12F683 microcontroller
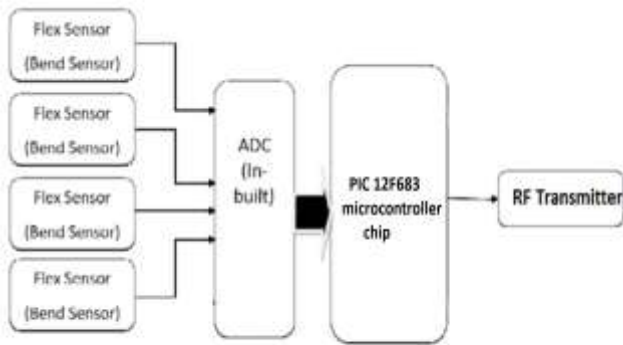
3. RF transmitter

4. 5V Battery

Fig. 2: Block Diagram for Transmission Section

Blocks contained in the receiver section are:

1. RF receiver

2. PIC18F45K20 microcontroller
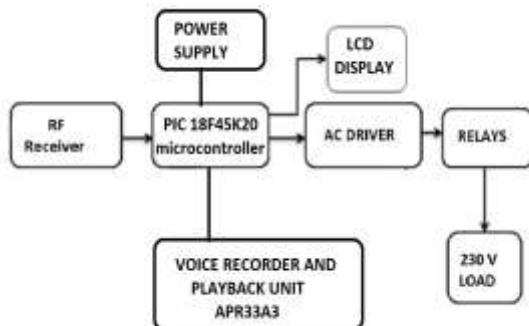
3. AC Driver

4. 16*2 LCD Display

5. Voice module

Fig. 3: Block Diagram for Receiver Section

In this project at transmitter section consist smart glove which contain the four flex sensors each on the four fingers of hand namely index, middle, ring and little. The flex sensors give their output in the form of change in resistance according to their bending angle. The output from the flex sensors is given to the in build ADC channels of the microcontroller PIC12F683. The processed ADC values from the microcontroller are compared with the threshold values of each flex sensor for the recognition of a particular gesture. The particular gesture is recognized at the receiving section .converted digital data is given to the microcontroller which transmits them through the RF module in a serial manner. For each value received at RF receiver, the microcontroller

18F45K20 gives corresponding commands to the LCD and the Voice Module. Thus we can get the corresponding voice output for each gesture and display of each recognized gesture in form of text on the LCD display. In the same way that it is used for the home automation. When particular data is receives it compared with preloaded data and corresponding home appliances are operated through relay driver circuit.
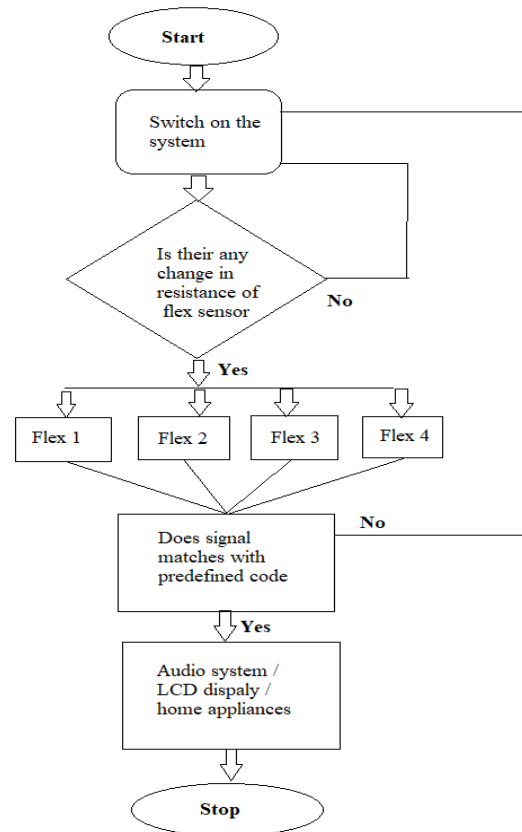

Fig. 4: Flowchart

3. HARDWARE AND SOFTWARE DETAILS

1. Details of hardware components used-

a. Flex sensors: In this system the hand gestures are recognized using flex sensor. These sensors are attached to the fingers of glove. Flex sensors are similar to variable resistor i.e potentiometer. The resistance of the sensor varies according to the amount of its angle of bending, which is depends on the movement of finger. Flex sensor are used to measure it precisely. The flex sensors have an average flat resistance about ten kilo ohms. When the sensor are bent the resistance offered by them increases.

Fig. 5: flex sensor

b. PIC12F683 microcontroller: This microcontroller is used to take the reading from the flex sensor in analog form and then converted into the digital form according to their cutoff values of each flex sensor.

Fig.6: PIC12F683 microcontroller

c. RF Transmitter and Receiver: RF transmitter transmit data from transmission section to the reception section in the form of RF waves. RF transmitter get data from PIC 12F683 and transmit it into packets over 2.4Ghz frequency. RF receiver get this data from transmitter and fed to PIC microcontroller 18F45K20

Fig .7: Rf Transmitter and Receiver

d. PIC18F45K20 microcontroller: This microcontroller Fetch data from RF receiver. Data is decoded according to the algorithm. Microcontroller then take the decision fed the data either Voice module or Relay Circuit according to decoded values.
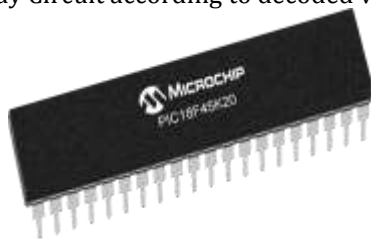

Fig. 8: PIC18F45K20

e. Relay Circuit: The relay circuit is used to switch on off the electronic appliances .Which is controlled by the microcontroller works on 12v supply. Relay driver is used to convert 5v supply to 12v supply provide to their relay circuit.

Fig. 9: Relay circuit.

f. APR33A3 voice recorder and playback: APR33A3 Voice play back module provides high quality recording and playback with 10 minutes audio at 8 KHz sampling rate and 16 bit resolution. The APR33A3 series are powerful audio processor containing audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). In this module we can also able to store 8 voice commands with each 20 sec long. Then each voice is play according to data it gets from the microcontroller.

Fig. 10: APR33A3 voice recorder and playback.

Hardware implementation of a system has been shown in figure 11.

Fig. 11: Hardware implementation of a system

2. Software details:

MPLAB IDE is used for the programming purpose this software is very user friendly from this software we can upload the code into microcontroller and we also compile and correct the errors.
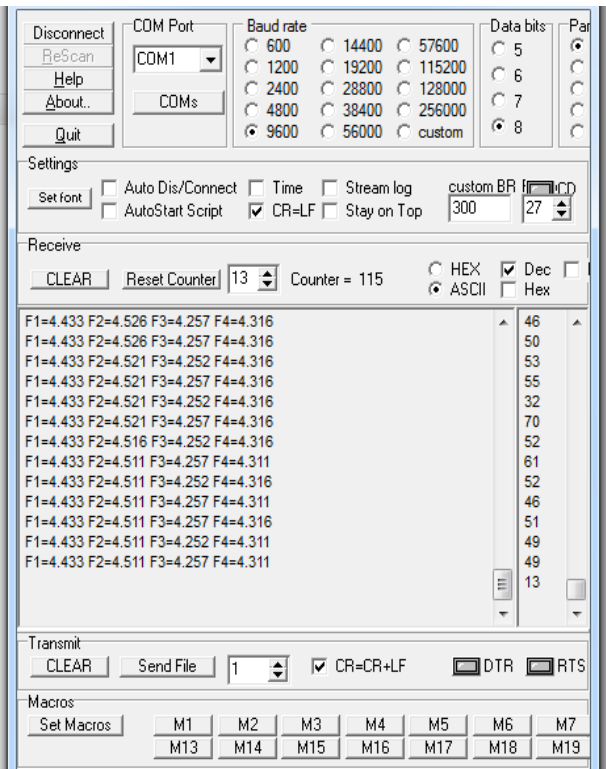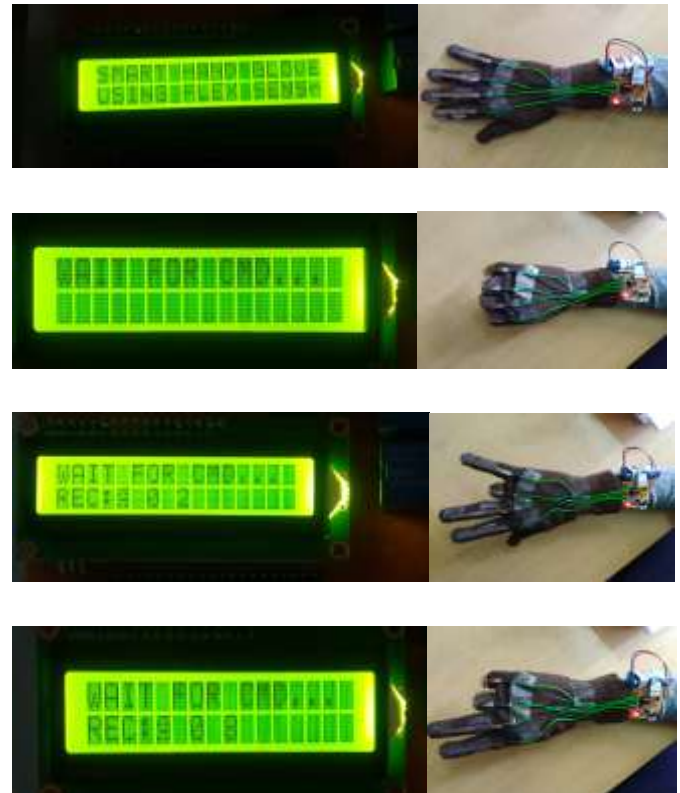

Fig. 12: Software results

4. RESULT

In this proposed system, the user forms a gesture and holds it approximately for 3 seconds to ensure proper recognition. Each gestures comprises of bending of all sensors in certain angles accordingly. Every bend of the finger produces unique ADC value so that when different hand gestures is made, different ADC values are produced accordingly. Taking such ADC values for 4 different users, a table of average ADC values for each sensor is maintained where F1, F2, F3, F4 represents the little finger, the ring finger, the middle finger and index finger respectively. Table 1 shows the gestures and corresponding words voiced out. The hand gestures taken in the prototype can be easily modified using the concept of ADC count according to the user convenience. At the same time the voice output can be changed easily by recording to gives a flexibility in change of language according to different regions.

Commands	Voice and Text
Command 1	Light ON
Command 2	Fan ON
Command 3	Bring me a glass of water
Command 4	I am hungry
Command 5	Thank you

Table 1: Commands and corresponding preloaded voice

Fig. 13: Display output

5. CONCLUSION

This project is useful for dumb, deaf and blind people to communicate with one another and with the normal people. The dumb people use their specific standard sign language which is not easily understandable by any common people and blind people cannot see their gestures. This proposed system converts the sign language is translated into some text from also, to facilitate the deaf and dumb as well. This text is display on LCD. In order to improve and facilitate the more gestures recognition, we can accommodate a number of other gestures as well for better and efficient communication .It is also useful in operate home appliances by using gestures.

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