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Gesture Recognition System Using Micro Controller

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Abstract:- Mainly deaf and dumb people face problem of communication with normal people. Communication plays major role for human being. So, for communication movement of hands and expression i.e. gestures play a major part. To overcome the problem of interaction with normal people, this paper proposed a gesture recognition system using microcontroller. Recognition of gesture is a wide discipline of research on interfacing human computers. There are two implementations of gesture i.e. based on Sensor and also on Vision. Solutions based on sensor have an accelerometer and flex for interpreting the gesture. Now the paper presented is an easy to use and inexpensive approach to a hand recognition system built around a flex sensor which converts sign language to speech. This system can definitely help many dump and deaf people to interact with normal people.

Keyword:- *Hand Gloves, Flex Sensor Gesture Recognition, Text to Speech, Microcontroller, Bluetooth Module.*

I. INTRODUCTION

Communication plays a vital role for human beings. In real world, there are 70 million people in worldwide and 3.19% in our country who are not able to speak and listen. People who are deaf and dump uses sign language i.e. Gesture, which is the most natural and expressive way. The gesture can be defined as a physical action which conveys information. Gesture are a very spread mean of communication among people. People uses gesture for expressing a diversity of internal states. The problem of interacting with other people can easily overcome by constructing a system which allows communication of such impaired with others.

Till now very little work has been develop software that translate this gesture into corresponding text to voice. In this project, a system is proposed which will help impaired pair to express their feeling in a appropriate way. Major Aim of this project is to recognize the gesture with precision and in minimum possible time. For this system, five flex sensors are used and each are fitted with length of each fingers and thumb. Here, only one hand is used. The particular gesture is shown in the form of text in LCD and thus further the text is converted into audio with the help of text to speech converter. This proposed system is quite portable, easy to handle and first step towards a reliable and efficient gesture recognition system. In order to bridge the gap between the dumb people and normal people we are developing a device called “Gesture recognition using microcontroller”.

II. LITERATURE REVIEW

Gestures is one of dynamic research area in human interface. Basically, there are two types of implementation techniques in gestures recognition system: Sensor based and Vision based [1]. Another acquired method for recognition of gesture using tree decision procedure. it is basically on information degree of randomness. Advantage of using this method are training, scalability, and testing speed and interpretability. Considered 65 different hand gestures with data glove as input device and are detected using rules derived from the decision tree [2]. One of the recognitions of hand gesture is using accelerometer i.e. using three axis (ADXL 335) sensor, ATHEGA 2560 and Bluetooth module. And thus, getting all the alphabet (A to Z) with the help of accelerometer sensor varying maximum and minimum values in each plane [3]. A significant application Non-touch hand gesture recognition feature using Deep conventional neutral network of ASL, input gesture is collected using webcam. From a running video frame still hand image is captured furthermore, performed DCNN so as to get progressively instructive feature and recognize the letter sign using MCSVM [4]. Even with the help of HSV color model and genetic algorithm hand recognition can be done [5]. Wii controller is also used for Gesture recognition [6]. A system for automatic real time control of a windowed OS entirely based on gesture recognition, it also allows mouse movement and file system operation likes drag and drop etc. [7]. One of proposed system is made by two parts: Segmentation and recognition. In division part, forefront region is taken from the picture and the closest individual is chosen as an recognition subject with the skin based and contour-based method feature is also added [8]. System built around multi-channel surface electromyogram sensor and 3D accelerometer sensors [9]. Even with the use of infra-red camera which measures 3D-surface points captured from the hand of the user and further the data is transformed in 3D points after the camera noise suppression [10].

III. METHOLOGY

A. Hardware Component:

- Flex Sensor: A flex sensor otherwise called power sensor is an adaptable sensor that adjustments in opposition which fundamentally relies upon the measure of curve on the sensor. Increment in the curve, likewise will expand the obstruction experience. At the point when the sensor is kept straight with no curve, it has a consistent safe of 10K Ohms. Also, encounters least two times more than the consistent obstruction at 1800 pinch curve. The flex sensor for the most part incorporates carbon resistive components inside a slim adaptable substrate where more carbon implies least opposition.

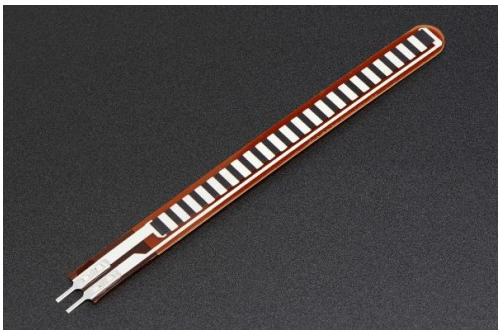

Fig 1:- Flex Sensor

- UNO Arduino Module: The flex sensor outputs which is given to the ADC of the Arduino module is in analog structure. The ADC change that simple into computerized structure.

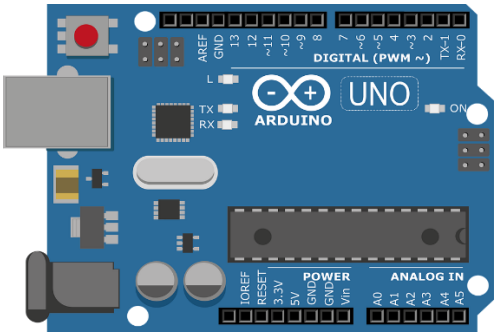

Fig 2:- UNO Arduino

- LCD: A 16*2 LCD (Liquid Crystal Display) screen has a presentation of 16 characters in each line and in this manner have 2 such lines. Mostly each character is shown in 5*7pixel configuration. It contains two registers in particular an data register to store the information to be show and order register to store the direction guidelines.

Fig 3:- LCD

- Bluetooth device: A Bluetooth device is Bluetooth SPP port. This device has 2.40 Ghz transceiver and baseband.

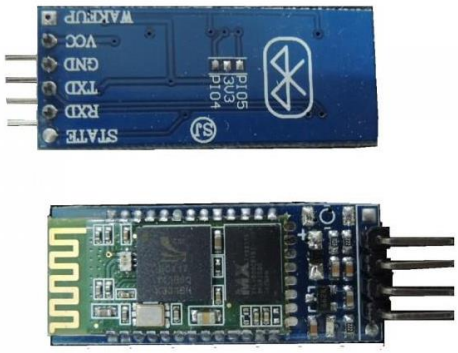

Fig 4:- Bluetooth Module

B. Software Used:

- Keil u version 3 is used for the development and basically this IDE uses C program. After compiling the code and debugging if the compilation is without error then a hex file is generated then it is loaded in microcontroller. 2) Arduino IDE enables the serial communication between the computer and the microcontroller. The data send from the microcontroller is display on the screen and as well as given to the "Text to Speech" application which converts the text to audio.

C. Block Diagram:

The hardware system plays a very crucial role in the acquisition of hand gestures. The following block diagram describe our prototype.

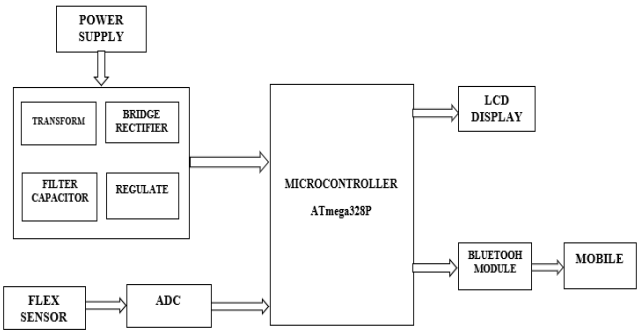

Fig 5:- Block Diagram

Main System is provided through a 5V, 1A battery. This supply is given to the UNO Arduino via a USB cable. The Arduino provide 5V supply to the flex sensor, Bluetooth module and display. The flex sensor gives analog voltage output corresponding to the movement of the finger. The 1k resistor are incorporated to make voltage divider circuit across the sensor. The output of the sensor is sent an input to 16-bit ADC inside the UNO Arduino board. The digital output of the ADC is feed to the microcontroller of the UNO Arduino for single processing.

The microcontroller compare input from the ADC and predefined value in the program. There is switch connected at port of UNO Arduino for the selection of flex-depended message. Message are shown by the movement made and subsequently output of the Arduino is sent to the LCD

show for showing message in plain view. Further, it is as well sent to the Bluetooth module thus the text to speech application convert the text into audio.

D. Algorithm:

On the basis of sign sequence and matching algorithm this algorithm is developed. On the basic of movement of the fingers we are going to recognize the gesture.

Algorithm:
Step 1: Values are taken from flex sensor and convert it into digital value.
Step 2: Compare the digital values which must fall into the range which is predefine in the program.
Step 3: if it is in particular range, then send the particular text data i.e. message to the PC monitor using serial communication.
Step 4: Thus, send the message to the LCD display as well as the Bluetooth Module.
Step 5: The Bluetooth Module send this data to the "Text to Speech" application, it converts the data i.e. Text into Audio.

Flow Diagram:

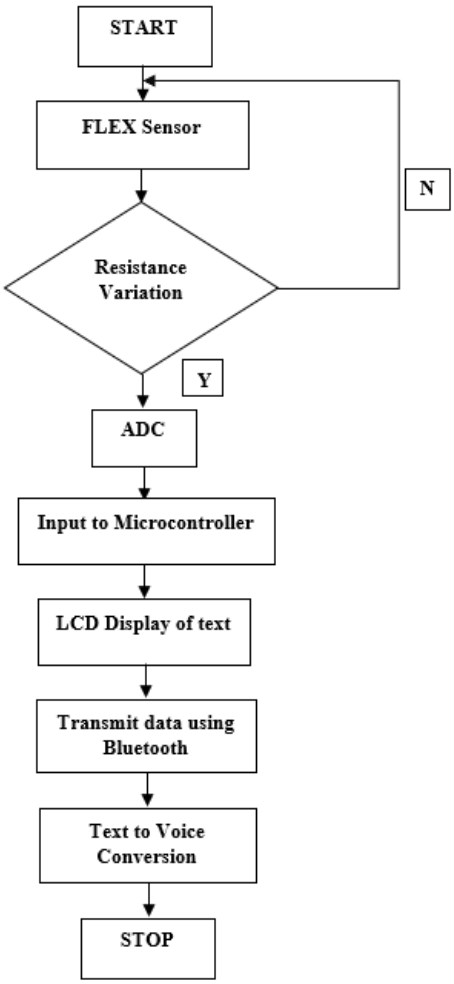

Fig 6:- Flow Diagram

Fig indicates the progression of algorithm essentially utilized in the technique of this framework. The sensor are connected with gloves to identify the right development of the fingers. For each sensor,initially the necessary voltage will be provided. As indicated by the development of the fingers there will be a voltage drop comparable to with it because of the variety in the resisitance. curving of the sensor influences variety of opposition. Thus the nature of the obtained voltage will be analogous in nature . ADC is mainly used to convert this analogy voltage to digital voltage and this voltage is fed to controller Arduino.5V DC needed for our hardware and therefore a 5v battery is used in this.A 16MHz crystal oscillator is used to supply the controller with the pulse in frequency clock. The primary electric board comprises of a controller that handles the program which is utilized to distinguish the analog voltage levels caught from the sensors, change them to advanced utilizing the ADC of the controller, makes the acknowledgment of the activity marked. Examination will be done between the input voltage with pre-characterized program voltage and appropriately it will show the output characters on the screen of LCD.Transfer the information to the bluetooth device and along these lines "Text to Speech" application changes over the Text to Speech(audio).

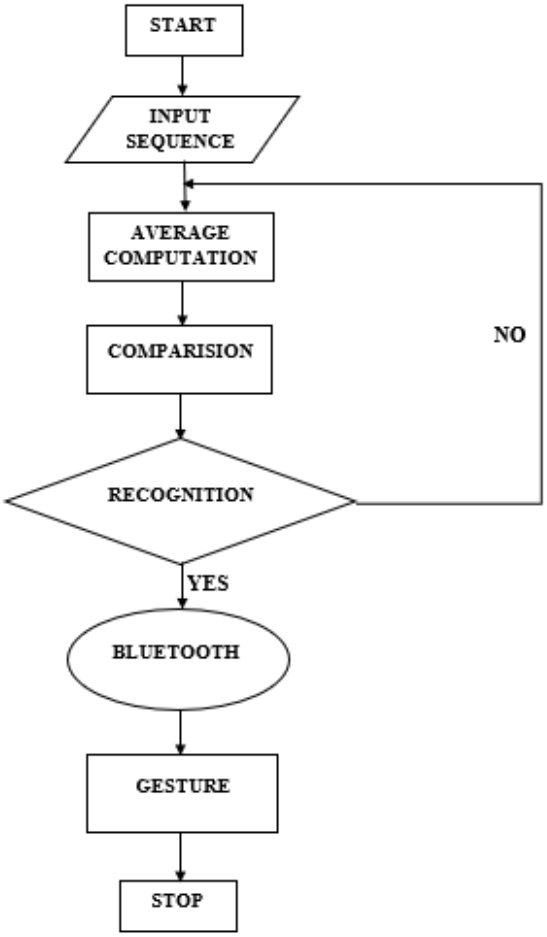

Fig 7:- Decode Gesture

IV. RESULT

Flex Sensors	Flex Sensor Value	Gestures
Sensor 1	57.5	LOVE
Sensor 2	37.5	FINE
Sensor 3	27.5	WASHROOM
Sensor 4	20.5	BEAUTIFUL
Sensor 5	11.5	PEACE

Fig 8:- Flex Sensor Value

Fig 9:- Gesture 1(washroom)

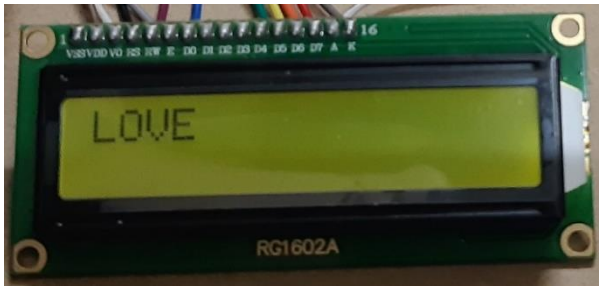

Fig 10:- Gesture 2 (Love)

Fig 11:- Gesture 3 (Beautiful)

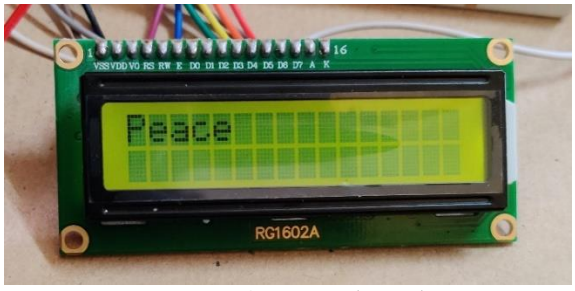

Fig 12:- Gesture 4 (Peace)

Fig 13:- Gesture 5 (Fine)

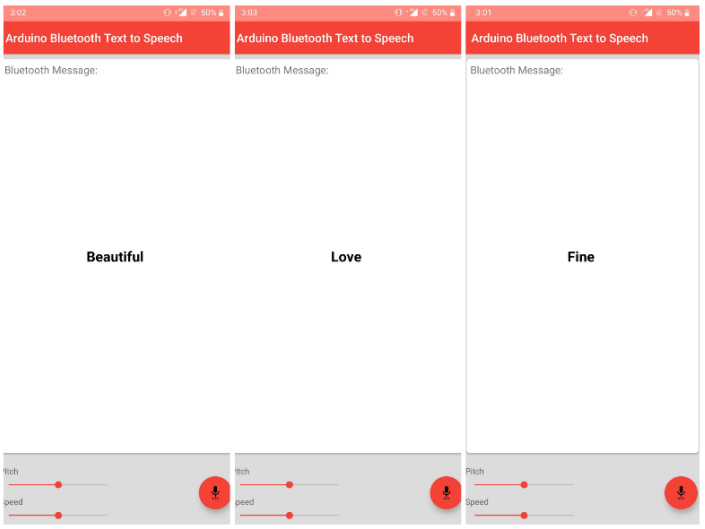

Fig 14:- Display in Text-to-Speech Application

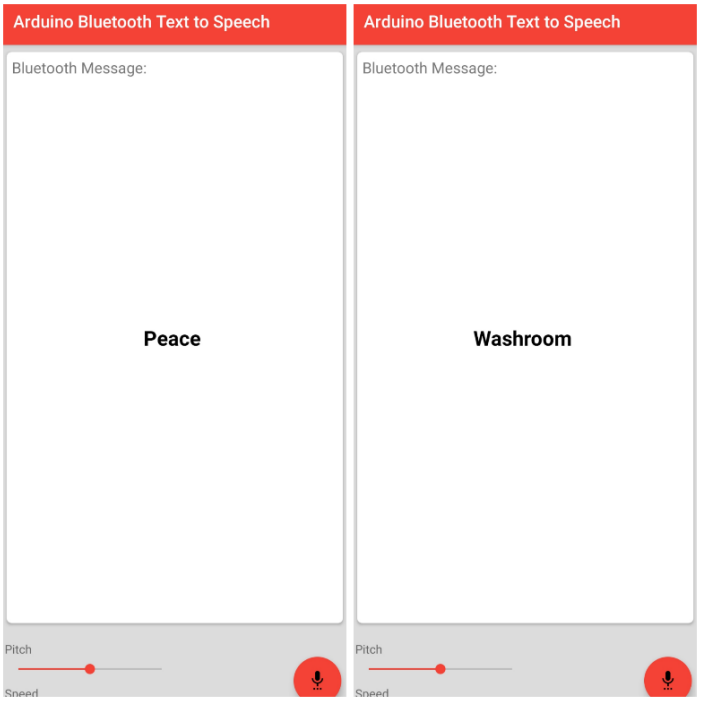

Fig 15:- Display in Text-to-Speech Application

V. CONCLUSION

This project is mainly for deaf and dump people to be able to communicate with normal human beings. Also useful for speech impaired and paralyzed patient those who are not able to speak properly. So, these people mainly use the gesture to communicate but normal person can't understand the sign language performed by them. So, to overcome these difficulties we have designed gesture recognized system. Using sensors like flex, convert the gesture into a text message displayed on to the screen and thus with the help of application like "text to speech" text can be translated to audio as well. Mainly focus of this study was to use technology as a tool for the conversion of gestures into message and audio(voice). Further used into a system which can be merged in to the telecommunication devices with cameras to diminish communication gap between the deaf, dump and normal people communities.

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