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Smart Speaking Glove-Virtual tongue for Deaf and Dumb

M.S.Kasar[1], Anvita Deshmukh[2], Akshada Gavande[3,] Priyanka Ghadage[4]

Assistant Professor, Dept. of E&TC, Bharati Vidyapeeth's College of Engineering For Women, Pune, India[1]

UG Student, Dept. of E&TC, Bharati Vidyapeeth's College of Engineering For Women, Pune, India[2,3, 4]

ABSTRACT: We develop a smart speaking glove for speechless patient & physically challenged people. Generally, speechless patient communicate through sign language which is not understood by normal human being. We have design the project that overcome this problem & make the smooth communication of speechless patient with normal people. We use flex sensors which are fitted with glove to sense the finger movements. According to the finger movement microcontroller ATmega328 will display message on LCD. The text message is converted into voice using speak jet & this voice is heard via speaker.

KEYWORDS*:* Flex sensor, finger movement, ATmega328, speak jet**.**

I.INTRODUCTION

In general we meet many people those are not able to speak comfortably with us like, deaf & dumb people. They are communicating by means of sign language. A gesture in a sign language is movement of finger with specific shape made out of them. We use sensor based recognition technique. We develop a module which converts finger movement to sound & also control the working of device like T.V, fan.

This project is useful for speechless patient; it is compact, flexible system & only takes less power to operate.

II.LITERATURE SURVEY

Glove- based system [1]
Glove system is composed of an array of sensor, electronics for data acquisition or processing, power supply & a support for sensors that can worn on user's hand. LED glove, data glove, Sayre glove, cyber glove are the different type of glove used here. Glove based system helps to user for selecting a particular glove for a particular application.

Glove Talk II [2]
Glove Talk II is a system which translates hand gestures to speech, which is based on the gesture to format model.Neural networks were used to implement an adaptive interface, called GloveTalk II, which contains hand gestures to control the parameters of a parallel formant speech synthesizer to allow a user to speak with his hands. It is used to implement an artificial vocal tract.

Bend sensor modeling [3]
Bend sensor is used for motion recognition. The model is used to track human joint movement and it recovers the original signal waveforms, which shows the joint rotation .also for the fastest human speed. Bend sensor modeling is demonstrated that bend sensor can be applied for human posture recognition.

Flex sensor [4]
Flex sensor measure the amount of deflection caused by bending the sensor .The flex sensor patented technology is based on resistive carbon element. It having thin flexible substrate, when substrate is bend, the sensor produces resistance value. They are usually in the form of a thin strip from 1 to 5 inches long. Flex sensors are used in applications like gaming glove, auto control, fitness products, measuring devices.

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Indian sign language using flex sensor [5]
There is five flex sensors are used & each are fitted on each finger & thumb. Using Indian sign language alphabets word is formed like "YES", "NO". For making this words user has to make an alphabet's sign. By getting each alphabet's sign separate word is form which is display on LCD.

Speak Jet [6]
Speak jet is sound synthesizer which is used to convert text data into voice. It uses mathematical Sound Architecture (MSA) technique to control five channel sound synthesizer to generate a speech signal. It is having 72 speech elements, 43 sound effects and 12 DTMF touch tones.by using MSA component and also pitch, rate, bend, and volume parameter user can generate various sound effects.

III.WORKING OF SYSTEM

Flex sensors are placed on gloves which can be easily operated by patient. According to change in finger movement the resistance values will change. The output voltage of flex sensors is in the analog form which is converted into digital form by using inbuilt ADC of ATmega328. These digital values are display on LCD. We have done the code for ATmega328 using arduino programming language. When the resistance values are matched corresponding message will displayed on LCD.

Speak jet is connected to port D of controller ATmega328. It produces the voice according to message which is display on LCD. The voice of speak jet is not audible for human ears for that we used power amplifier to boost the voice signal. This voice will hear via speaker.

For emergency situation like, if the person is not available inside the room and patient want to turn on light in his/her room, the controller will operate the device connected to its relay like TV or bulb.

IV.SYSTEM BLOCK DIAGRAM

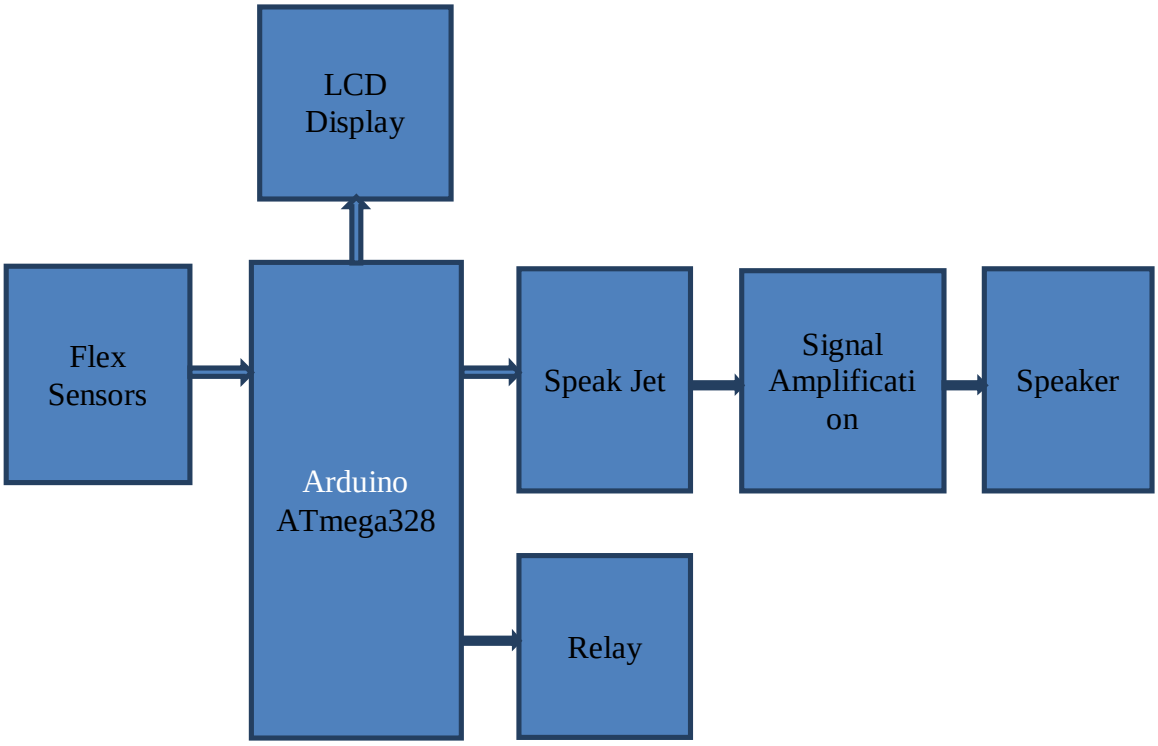

Fig.1.Block diagram

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V. HARDWARE DETAILS

A. Flex sensor

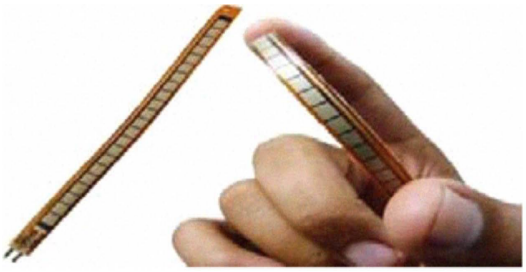

Fig .2.Flex sensor

In fig.2.it shows the flex sensors are used as input and are placed on the glove. They convert the bend into electrical resistance. If bending is more resistance value will more. They are usually in the form of a thin strip having resistance 10K ohm to 15K ohm. It is very comfortable because of having less weight. Inside the flex sensor there is a carbon resistive element within thin substrate. When substrate is bend the sensor produces a resistance output related to the bend radius.

TABLE I.

Size	1”/3”/5” long
Bend resistance	Up to 125k ohm
Life cycle	Greater than 1 million
Tolerance	+- 30%
Temperature range	-35^0 to $+80^0$
Voltage	5 to 12V

Characteristics of flex sensor.

In the Table I. it shows the characteristics of flex sensor. It defines electrical and mechanical specifications of flex sensor.

B. ATmega328

The outputs from the sensors are fed to the analog port pin of ATmega328 .The inbuilt ADC of ATmega328 will convert analog voltage from sensors to the digital voltage. The flash memory of ATmega328 is programmed in such way that there is code corresponding to each of the digital value. This is done by ADC.

C.16x2 LCD

The data lines of LCD are connected to the port D of microcontroller so that when finger movement is done corresponding messages are sent by microcontroller to display them on LCD module.

D. Speech module

Here we use speak jet IC as sound synthesizer. The output of the ATmega328 is serial data is sent to the speak jet that has a Mathematical Sound Architecture, already stored allophones that are spoken according to the data received from microcontroller. It required 8-bit code to speak.

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E. Signal amplification

The voice output from the speak jet is not much audible to human ears therefore; it is fed to an amplifier that enhance the volume. This voice is heard via speaker.

F. Relay and Relay driver circuit

According to finger movement shown, relay will turn on-off. Relay is interface to the microcontroller through Relay driver circuit.

VI.SOFTWARE DETAILS

Arduino

The Arduino board uses a microcontroller IC which has to be programmed to perform any task. This program is written in the Arduino Programming language (APL).After checking the program it is loaded into the memory of the microcontroller on the board using a serial or USB connection.

In the fig.3.it shows the Magnevation Phrase Translator for speak jet . This translator has a dictionary of commonly used English words and phrases, and displays the appropriate codes that will need for programming.

Fig.3 .Magnevation Phrase Translator

In the fig.4.it shows the speak Jet phrase editor used to make a words using speak jet dictionary. Once you've typed something in to the "Say Data" box, click on the "View Codes" button just to the right of the box. After that we will see a dialog box .It shows the code for particular words which is used for coding in arduino programming.

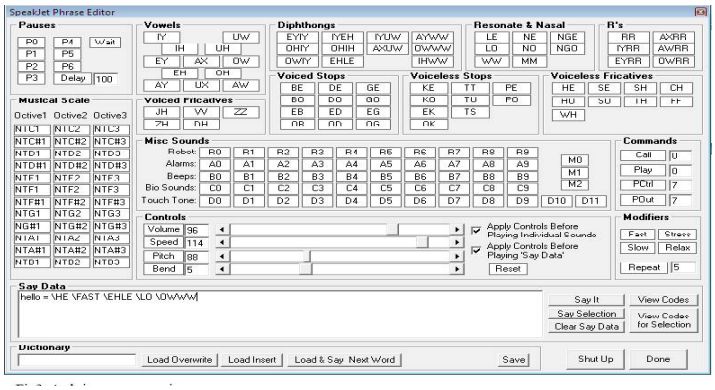

Fig.4 speak Jet phrase editor

In the Fig.5.it shows the Arduino programming for flex sensor, LCD, Relay and speak jet. We define five analog pins of Arduino for flex sensor input, also define pin no. seven for relay and pin no. zero for button pin. As discussed in fig .4 we get data for further programming.

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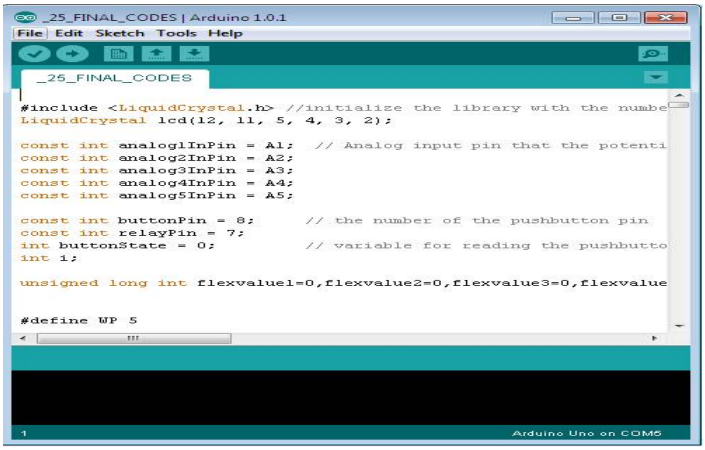

Fig.5.Arduino programming

V. RESULT

TABLE II

In the Table II. It shows the finger movements made by the user if the matching of resistance value is done then the message will produce according to predefined data.

Finger Movement	Message
	Switch off light
	Switch on light

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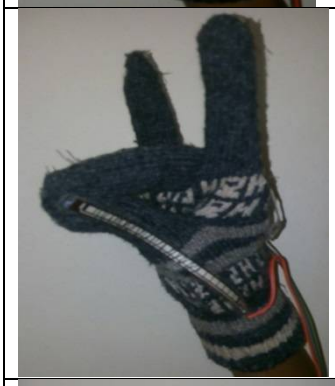
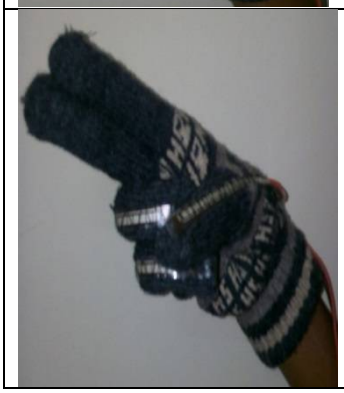
	Turn on T.V
	I want tea
	Please leave me alone

Finger Movement and messages

VI.CONCLUSION

This project is useful for speech impaired people who will fill the communication gap between deaf or dumb people and normal people. In future it can be used in application like remote handling, smooth traffic control.

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