# GESTURE VOCALIZER DEAF AND DUMB PEOPLE

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DEPARTMENT OF ECE
ASANSOL ENGINEERING COLLEGE
Vivekananda Sarani, Kanyapur, Asansol, West Bengal – 713305

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# Abstract

Gesture Vocalizer is a project for social purpose. From the survey we found that it is really very difficult for deaf peopleto communicate with other people. Normally deaf people speak with hand gestures and it is difficult for other people to understand their sign language. We are going to implement gesture-based vocalizer which will detect all the gestures of deaf people and convert it into voice and also candisplay it on LCD screen. For that we are making use of ARM 7 controllers to interface all of the sensors and speech synthesizer. Basically, data glove contains two types of sensors flex sensor and accelerometer as a tilt sensor. A wireless data gloves is used which is normal cloth driving gloves fitted with flex sensors along the length of each fingerand the thumb. Dumb people can use the gloves to perform hand gesture and it will be converted into speech so that other people can understand their expression. This system is useful for dumb people to communicate with other people.

# 1. INTRODUCTION:

In our daily life we used speech and gestures of hand for communication between human beings. Research in this project aims to integrate the gesture Human Computer Interaction (HCI). For communication between human being gestures and speech are completely coordinated to each other. This paper analyses the data from data glove for recognition of signs and the gestures. A system is designed for recognizing these signs and their conversion into voice. The result of this design expects the accurate and noiseless conversion of gestures into voice. A gesture in a sign language is movement of fingers and tilting of hand in particular directions withspecific angles. Signs language consists of different signs for differentwords. It also contains of different sign for different letters to createwords that don't have any sign in that sign language. In this device we used Flex sensors which plays a major role in our project. Flex sensors are used at each finger of hand. When we bend our fingers, it changes the resistance which in turn converted into voltage. It is the device which contains data glove that can translate Sign language into speech to make the communication between the deafpeople with normal people easily. We are using (ARM7) controller for interfacing the communication between deaf and normal people.We are also displaying the conversion of gestures in the form of texton LCD display for the people who are unable to hear the voice. So that they can easily communicate with the deaf people.

# 2. COMPONENTS (USED IN PROJECT)

## 1. FLEX SENSOR:

- A flex sensor is a kind of sensor which is used to measurethe amount of defection otherwise bending. The designing of this sensor can be done by using materials like plastic and carbon. The carbon surface is arranged on a plastic strip as this strip is turned aside then the sensor's resistance will be changed.

- Flex sensors plays the major role in Gesture Vocalizer. Flex sensors in gesture vocalizer is used as bend sensors. We connect the flex sensors at each finger of hand. Flex sensors are used to detect the bending of fingers.

Fig 1: Flex Sensor

## 2. ARDUINO UNO:

- The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits.
- Gesture controlled robot works on the principle of accelerometer which records hand movements and sends that data to the comparator which assigns proper voltage levels to the recorded movements. That information is then transferred to an encoder which makes it ready for RF transmission.

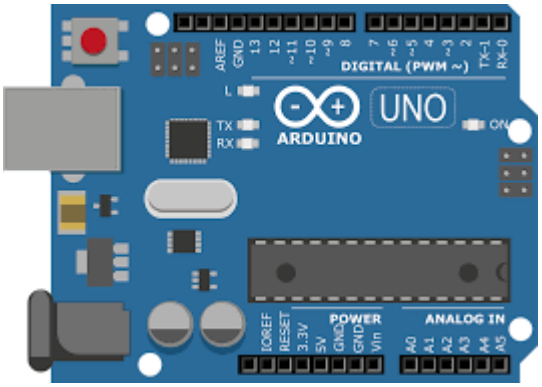


Fig-2: Arduino UNO

## 3. BLUETOOTH (HC – 05):

- HC-05 Bluetooth Module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC.

- In this project the role of Bluetooth module configured only by AT Commands. Master can initiate connection with other Bluetooth module while slave can receive data. It cannot initiate the connection with another module.

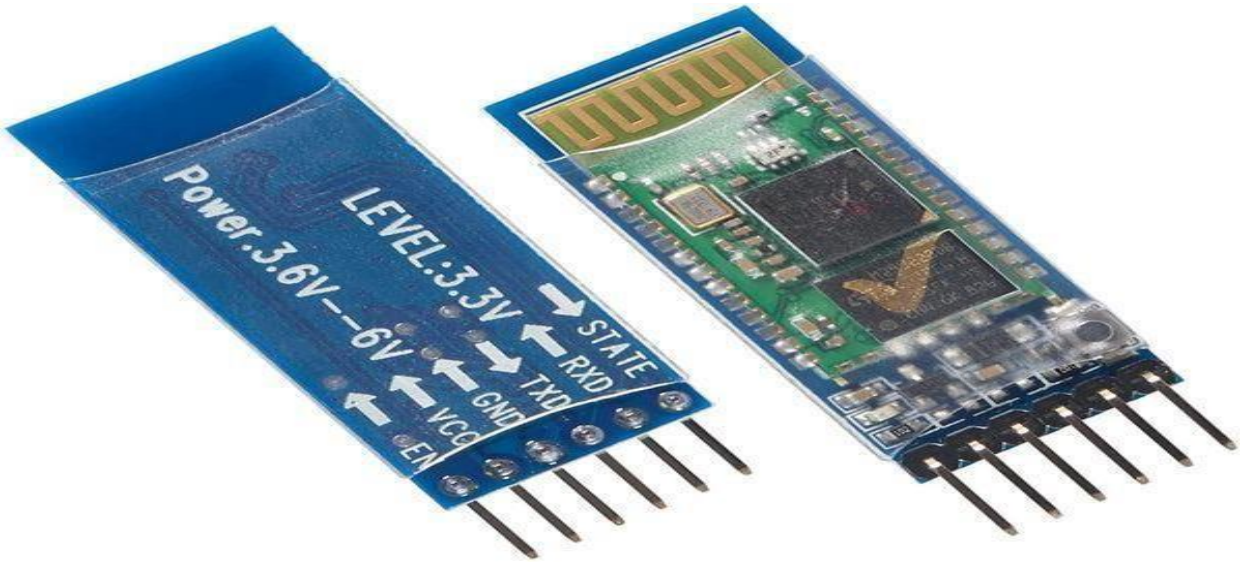


Fig-3: Bluetooth (HC-05)

# 4. ACCELEROMETER:

- An accelerometer is an electronic sensor that measures the acceleration forces acting on an object, in order to determinethe object's position in space and monitor the object's movement. Acceleration, which is a vector quantity, is the rate of change of an object's velocity (velocity being the displacement of the object divided by the change in time).
- Accelerometer in the Gesture Vocalizer system is used as a tilt sensor, which detect the tilting of the hand. 3.3 Tilt Detection: Accelerometer is used to detect the bending of thehand and sending the data, to the bend detection module. Theoutput of accelerometer is obtained by amplification.


Fig-4: Accelerometer (ADXL335)

## 5. **CONNECTING WIRE (JUMPER WIRE):**

- A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used tointerconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment orcomponents, without soldering.
- In this project the jumper wires are connecting the components and passing the signals to the component.

Fig-5: Connecting Wire (Jumper Wire)

# 3.ARDUINO UNO PROGRAM:

```
#include <SoftwareSerial.h>
SoftwareSerial mySerial(5,4);
char temp = '0';
//variable initializtion
int xpin = A5;
int xadc = 0;
int xmax = 0;
int xmin = 1023;

int ypin = A6;
int yadc = 0;
int ymax = 0;
int ymin = 1023;

int FLEX_PIN1 = A0;
int flexADC1 = 0;
int sensorMin1 = 1023;
int sensorMax1 = 0;

int FLEX_PIN2 = A1;
int flexADC2 = 0;
int sensorMin2 = 1023;
int sensorMax2 = 0;

int FLEX_PIN3 = A2;
int flexADC3 = 0;
int sensorMin3 = 1023;
int sensorMax3 = 0;

int FLEX_PIN4 = A3;
int flexADC4 = 0;
int sensorMin4 = 1023;
int sensorMax4 = 0;

int FLEX_PIN5 = A4;
int flexADC5 = 0;
int sensorMin5 = 1023;
int sensorMax5 = 0;
void setup()

{mySerial.begin(9600);
while (!Serial)
{
; // wait for serial port to connect. Needed for native USB poRT}
```

```
while(millis()<15000)
{if(digitalRead(7)==HIGH)
{
float flexADC1 = analogRead(FLEX_PIN1);
float flexADC2 = analogRead(FLEX_PIN2);
float flexADC3 = analogRead(FLEX_PIN3);
float flexADC4 = analogRead(FLEX_PIN4);
float flexADC5 = analogRead(FLEX_PIN5);

if(flexADC1<sensorMin1)
{sensorMin1=flexADC1;}

if(flexADC1>sensorMax1)
{sensorMax1=flexADC1;}

if(flexADC2<sensorMin2)
{sensorMin2=flexADC2;}

if(flexADC2>sensorMax2)
{sensorMax2=flexADC2;}

if(flexADC3<sensorMin3)
{sensorMin3=flexADC3;}

if(flexADC3>sensorMax3)
{sensorMax4=flexADC4;}

if(flexADC5<sensorMin5)
{sensorMin5=flexADC5;}

if(flexADC5>sensorMax5)
{sensorMax5=flexADC5;}

if(flexADC4<sensorMin4)
{sensorMin4=flexADC4;}

if(flexADC4>sensorMax4)
{sensorMax4=flexADC4;}

void printfun(char cp) //to avoid printing repeating symbols
{if(cp!=temp)
mySerial.print(cp);
temp=cp;}}
void loop()
{
// reading sensor value
float flexADC1 = analogRead(FLEX_PIN1);
float flexADC2 = analogRead(FLEX_PIN2);
float flexADC3 = analogRead(FLEX_PIN3);
float flexADC4 = analogRead(FLEX_PIN4);
float flexADC5 = analogRead(FLEX_PIN5);

flexADC1 = constrain(flexADC1,sensorMin1, sensorMax1);
flexADC2 = constrain(flexADC2,sensorMin2, sensorMax2);
flexADC3 = constrain(flexADC3,sensorMin3, sensorMax3);
flexADC4 = constrain(flexADC4,sensorMin4, sensorMax4);
flexADC5 = constrain(flexADC5,sensorMin5, sensorMax5);

float angle1= map(flexADC1, sensorMin1, sensorMax1, 0, 90);
```

```
float angle2= map(flexADC2, sensorMin2, sensorMax2, 0, 90);float angle3=
map(flexADC3, sensorMin3, sensorMax3, 0, 90);float angle4= map(flexADC4,
sensorMin4, sensorMax4, 0, 90);float angle5= map(flexADC5, sensorMin5,
sensorMax5, 0, 90);

xadc = analogRead(xpin);
yadc = analogRead(ypin);

if(((angle1>=70)&&(angle1<=82))&&((angle2>=77)&&(angle2<=95))&&((angle3>=70
)&&(angle3<=86))&&((angle4>=73)&&(angle4<=85))&&((angle5>=0)&&(angle5<=45))
)
printfun('A');
if(((angle1>=0)&&(angle1<=10))&&((angle2>=0)&&(angle2<=10))&&((angle3>=0)&&
(angle3<=12))&&((angle4>=0)&&(angle4<=10))&&((angle5>=65)&&(angle5<=80)))
printfun('B');
if(((angle1>=40)&&(angle1<=72))&&((angle2>=50)&&(angle2<=90))&&((angle3>=51
)&&(angle3<=75))&&((angle4>=42)&&(angle4<=66))&&((angle5>=34)&&(angle5<=50)
))
printfun('C');
if(((angle1>=50)&&(angle1<=72))&&((angle2>=45)&&(angle2<=90))&&((angle3>=35
)&&(angle3<=75))&&((angle4>=0)&&(angle4<=10))&&((angle5>=45)&&(angle5<=80))
&&!(((xadc>=412)&&(xadc<=418))&&((yadc>=340)&&(yadc<=360))))
printfun('D');
if(((angle1>=68)&&(angle1<=88))&&((angle2>=68)&&(angle2<=90))&&((angle3>=50
)&&(angle3<=80))&&((angle4>=54)&&(angle4<=80))&&((angle5>=58)&&(angle5<=88)
))
printfun('E');
if(((angle1>=0)&&(angle1<=10))&&((angle2>=0)&&(angle2<=10))&&((angle3>=0)&&
(angle3<=10))&&((angle4>=15)&&(angle4<=45))&&((angle5>=34)&&(angle5<=65)))
printfun('F');
if(((angle1>=75)&&(angle1<=90))&&((angle2>=75)&&(angle2<=90))&&((angle3>=65
)&&(angle3<=90))&&((angle4>=0)&&(angle4<=15))&&((angle5>=0)&&(angle5<=30))&
&(((xadc>=400)&&(xadc<=420))&&((yadc>=340)&&(yadc<=360))))
printfun('G');
if(((angle1>=70)&&(angle1<=85))&&((angle2>=75)&&(angle2<=90))&&((angle3>=0)
&&(angle3<=10))&&((angle4>=0)&&(angle4<=10))&&((angle5>=50)&&(angle5<=65))&
&!(((xadc>=410)&&(xadc<=420))&&((yadc>=368)&&(yadc<=380))))
printfun('H');
if(((angle1>=0)&&(angle1<=10))&&((angle2>=50)&&(angle2<=70))&&((angle3>=50)
&&(angle3<=70))&&((angle4>=50)&&(angle4<=70))&&((angle5>=50)&&(angle5<=85)&
&((xadc>=410)&&(xadc<=420))&&((yadc>=330)&&(yadc<=370))))
printfun('I');
if(((angle1>=0)&&(angle1<=10))&&((angle2>=50)&&(angle2<=70))&&((angle3>=50)
&&(angle3<=70))&&((angle4>=50)&&(angle4<=70))&&((angle5>=50)&&(angle5<=85))
&&(!((xadc>=410)&&(xadc<=420))&&((yadc>=355)&&(yadc<=370))))
printfun('J');
if(((angle1>=60)&&(angle1<=75))&&((angle2>=60)&&(angle2<=85))&&((a ngle3>=0)
&&(angle3<=10))&&((angle4>=0)&&(angle4<=15))&&((angle5>=30)&&(angle5<=55))&
&(((xadc>=404)&&(xadc<=415))&&((yadc>=368)&&(yadc<=380))))
printfun('K');
if(((angle1>=75)&&(angle1<=90))&&((angle2>=75)&&(angle2<=90))&&((angle3>=70
)&&(angle3<=90))&&((angle4>=0)&&(angle4<=15))&&((angle5>=0)&&(angle5<=30))&
&(((xadc>=390)&&(xadc<=405))&&((yadc>=360)&&(yadc<=380)))&&!((xadc>=270)&&(
xadc<=300))&&((yadc>=360)&&(yadc<=390)))
printfun('L');
if(((angle1>=40)&&(angle1<=61))&&((angle2>=72)&&(angle2<=84))&&((angle3>=45
)&&(angle3<=65))&&((angle4>=62)&&(angle4<=75))&&((angle5>=65)&&(angle5<=86)
))
```

```
printfun('M');
if(((angle1>=54)&&(angle1<=70))&&((angle2>=50)&&(angle2<=61))&&((angle3>=48
)&&(angle3<=66))&&((angle4>=60)&&(angle4<=76))&&((angle5>=50)&&(angle5<=65)
)&&(((xadc>=400)&&(xadc<=435))&&((yadc>=350)&&(yadc<=390))))
printfun('N');
if(((angle1>=68)&&(angle1<=88))&&((angle2>=68)&&(angle2<=90))&&((angle3>=50
)&&(angle3<=80))&&((angle4>=54)&&(angle4<=80))&&((angle5>=0)&&(angle5<=30))
)
printfun('O');
if(((angle1>=60)&&(angle1<=75))&&((angle2>=60)&&(angle2<=85))&&((angle3>=0)
&&(angle3<=10))&&((angle4>=0)&&(angle4<=15))&&((angle5>=30)&&(angle5<=55))&
&(((xadc>=270)&&(xadc<=290))&&((yadc>=360)&&(yadc<=380))))

printfun('P');
if(((angle1>=75)&&(angle1<=90))&&((angle2>=75)&&(angle2<=90))&&((angle3>=65
)&&(angle3<=90))&&((angle4>=0)&&(angle4<=15))&&((angle5>=0)&&(angle5<=30))&
&(((xadc>=270)&&(xadc<=300))&&((yadc>=360)&&(yadc<=390))))

printfun('Q');
if(((angle1>=40)&&(angle1<=72))&&((angle2>=45)&&(angle2<=90))&&((angle3>=20
)&&(angle3<=45))&&((angle4>=0)&&(angle4<=10))&&((angle5>=45)&&(angle5<=80))
&&(((xadc>=412)&&(xadc<=418))&&((yadc>=340)&&(yadc<=360))))

printfun('R');
if(((angle1>=70)&&(angle1<=90))&&((angle2>=80)&&(angle2<=90))&&((angle3>=80
)&&(angle3<=90))&&((angle4>=80)&&(angle4<=90))&&((angle5>=60)&&(angle5<=80)
))
printfun('S');
if(((angle1>=40)&&(angle1<=61))&&((angle2>=72)&&(angle2<=84))&&((angle3>=45
)&&(angle3<=65))&&((angle4>=44)&&(angle4<=63))&&((angle5>=65)&&(angle5<=86)
)&&(digitalRead(6)==HIGH))

printfun('T');
if(((angle1>=70)&&(angle1<=90))&&((angle2>=80)&&(angle2<=90))&&((angle3>=0)
&&(angle3<=10))&&((angle4>=0)&&(angle4<=10))&&((angle5>=60)&&(angle5<=80)))

printfun('U');
if(((angle1>=70)&&(angle1<=90))&&((angle2>=80)&&(angle2<=90))&&((angle3>=0)
&&(angle3<=10))&&((angle4>=0)&&(angle4<=10))&&((angle5>=60)&&(angle5<=80))&
&(digitalRead(6)==HIGH))

printfun('V');
if(((angle1>=70)&&(angle1<=90))&&((angle2>=0)&&(angle2<=10))&&((angle3>=0)&
&(angle3<=10))&&((angle4>=0)&&(angle4<=10))&&((angle5>=60)&&(angle5<=80)))

printfun('W');
if(((angle1>=50)&&(angle1<=72))&&((angle2>=45)&&(angle2<=90))&&((angle3>=35
)&&(angle3<=75))&&((angle4>=80)&&(angle4<=89))&&((angle5>=45)&&(angle5<=80)
))//&&!(((xadc>=412)&&(xadc<=418))&&((yadc>=340)&&(yadc<=360))))

printfun('X');
if(((angle1>=0)&&(angle1<=10))&&((angle2>=70)&&(angle2<=90))&&((angle3>=60)
&&(angle3<=80))&&((angle4>=80)&&(angle4<=90))&&((angle5>=15)&&(angle5<=35))
)
```

```
printfun('Y');

if(((angle1>=50)&&(angle1<=72))&&((angle2>=45)&&(angle2<=90))&&((angle3>=35
)&&(angle3<=75))&&((angle4>=0)&&(angle4<=10))&&((angle5>=45)&&(angle5<=80))
&&(((xadc>=412)&&(xadc<=418))&&((yadc>=340)&&(yadc<=360))))
printfun('Z');

delay(200);

}
```

## 4. BLOCK DIAGRAM:

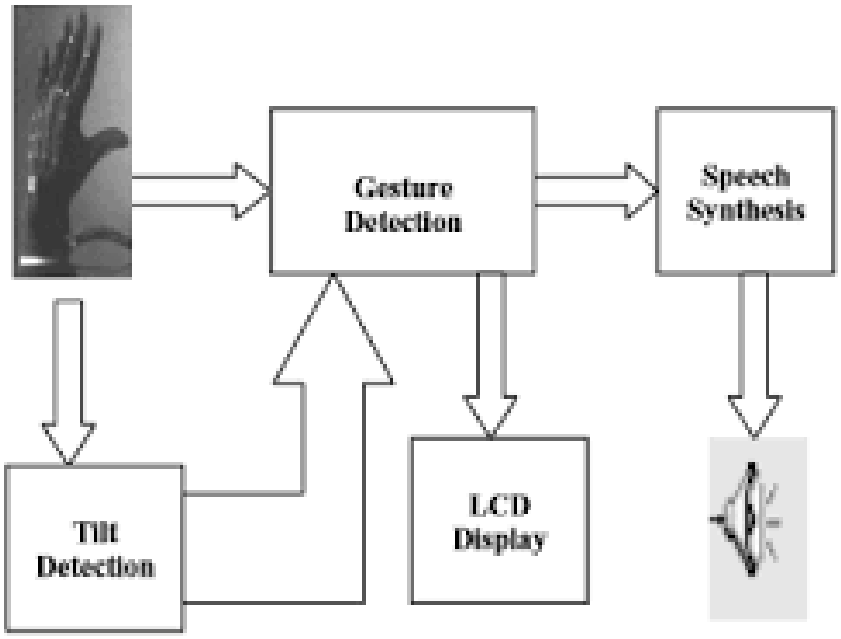


**Fig:6**

**(BLOCK DIAGRAM OF GESTURE VOCALIZER FOR DEAF AND DUMB PEOPLE)**

- **CIRCUIT DIAGRAM:**

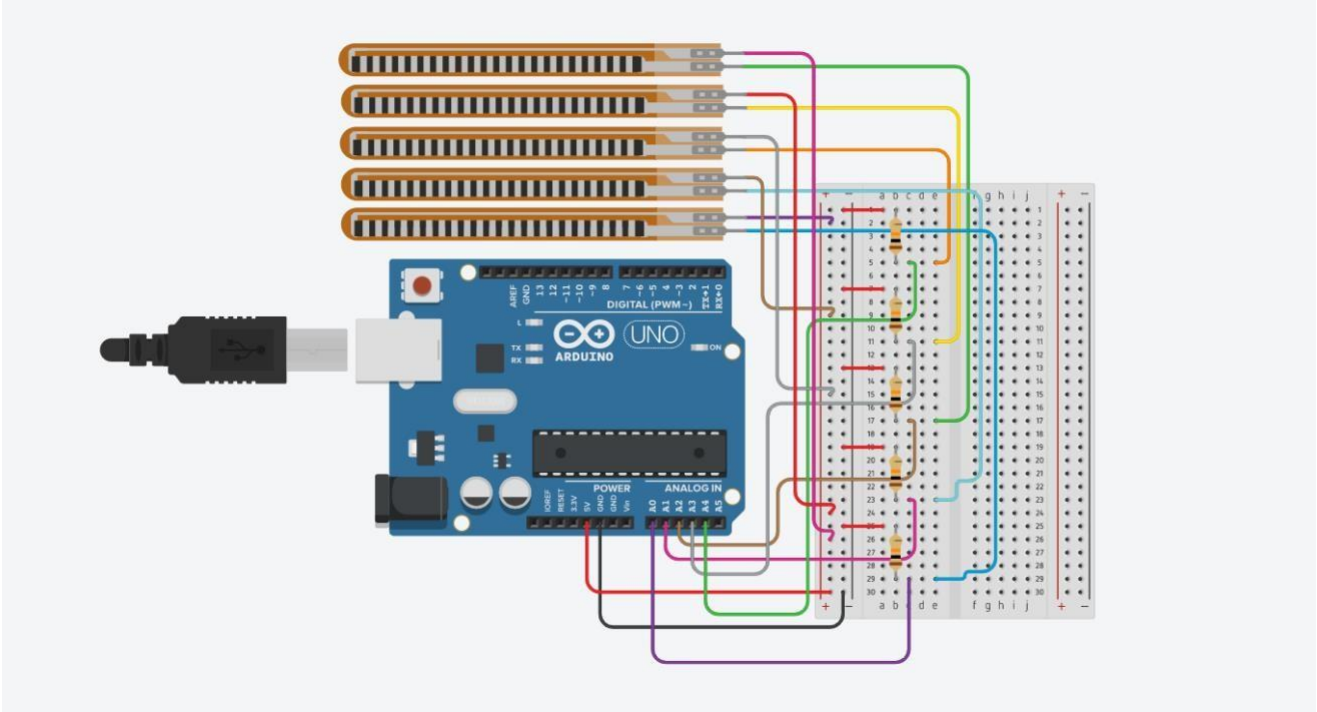


**Fig:7**

**(CIRCUIT DIAGRAM OF GESTURE VOCALIZER FOR DEAFAND DUMB PEOPLE)**

# 5. MOTIVATION OF THE PROJECT

Humans possess the voice capability for interaction and communication among each other. Unfortunately, not everybody has the capability of speaking and hearing. Sign language used among the community of people who cannot speak or hear as the means of communication. Sign language is a gesture representation that involves simultaneously combining hand shapes, orientation and movement of the hands and arms or body, and facial expressions to express fluently with a speaker's thoughts. The people who cannot speak makes use of the sign languages to communicate with other fellow vocally impaired person and even with other normal people who knows the meanings of sign languages or an interpreter is needed to translate the meanings of sign languages to other people who can speak and do not know the meanings of sign languages.

However, it is not always possible for an individual to be around all the time to interpret the sign languages Hand Gesture Vocalizer for Dum band Deaf People and not everybody can learn the sign languages. Thus, another alternative is that we can use a computer or a smart phone as a mediator. The computer or a smartphone could take an input from the vocally impaired person and give its textual as well as and audio form of output.

## 6. RESULT AND DISCUSSION:

This system is useful for deaf and dumb people to communicate withone another and with common people. The dumb people use their sign language which is difficult for common people and deaf peopleto understand. This system converts the sign language into speech which is easy for deaf and normal people to understand their language. The sign language is translated into some visual form, to understand for the deaf people also. This text is display on LCD. Signlanguage is a useful for communication between the deaf community and the normal people. This project is basically designedto minimise the communication gap between the dumb people andthe normal one. With this project the dumb people can use the datagloves Which is used to perform sign language and it will be converted into voice so that normal people can easily understand and also display it on LCD so that people who cannot hear can read it on the screen.

# 7. FUTURE WORK:

- Perfection in monitoring and sensing of the dynamic movements involved in “Gesture Based Vocalizer”.

- Designing of a jacket, which would be capable of recognizingthe gestures and movements of animals.

- Developing a custom vocalizer module that can provide morenumber of voice outputs than the standard one available in the market while at the same time cost less if considered for mass production.

- Generate gestures for as many words as possible and developa machine learning system that can interpret the various words generated and develop a sentence on its own. This would reduce the load on the system due to storage of large sentences and make the system more robust and adaptive.

- Interface with voice assistants like Siri or Alexa to generate voice outputs rather than the vocalizer module. This would make the system more compact and be used on various platforms like mobile phones that would make it portable.

- Use hand gestures to control vehicles. This would beparticularly useful for wheelchair bound people who find it difficult to manoeuvre it and require assistance of someone.

- Further integrated with various services and help togenerate employment for the deaf and dumb people.

- Geared up with the controller to provide home automation on finger tips.

- Paired up with fitness sensor to monitor health of theindividual.

# 8. REFERENCES:


**1.** Srinivas Gutta, Jeffrey Huang, Ibrahim F. Imam, and Harry Wechsler,"Face and Hand Gesture Recognition Using Hybrid Classifiers", ISBN: 0- 8186-7713-9/96, pp.164-169

**2.** Jean-Christophe Lementec and Peter Bajcsy, "Recognition of Am Gestures Using Multiple Orientation Sensors: Gesture Classification", 2004 IEEE Intelligent Transportation Systems Conference Washington, D.C., USA, October 34, 2004, pp.965-970

**3.** Md. Al-Amin Bhuiyan, "On Gesture Recognition for Human-Robot Symbiosis", The 15th IEEE International Symposium on Robot and Human

**4.** Sanshzar Kettebekov, Mohammed Yeasin and Rajeev Sharma, "Improving Continuous Gesture Recognition with Spoken Prosody", Proceedings of the 2003 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'03), ISBN # 1063- 6919/03, pp.1-6

**5.** Masumi Ishikawa and Hiroko Matsumura,"Recognition of a Hand- Gesture Based on Selforganization Using a Data Glove", ISBN # 0-7803- 5871-6/99, pp. 739-745

**6.** Prerana K.C, Nishu Mahato, and Bishruti Satyal, "Hand Gesture Recognition using KINECT," Nepal Engineering College, Baktapur, Bachelor Thesis P3-I.0-14-4, 2015.

**7.** M. S Kasar, Anvita Deshmukh, Akshada Gavande, and PriyankaGhadage, "Smart Speaking GloveVirtual tongue for Deaf and Dumb,"Internaltional Journal of Advanced Research in Electrical, Electronicsand Instrumentation Engineering, vol. 5, no. 3, p. 7, Mar. 2016.

**8.** Savan Patel. (2017, May) medium.com. [Online].