Global Academy of Technology

Department Of Electronics and Communication Engineering

OPEN DAY PROJECT REPORT

Title: Hand gesture recognition and voice conversion system for dumb people.

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ABSTRACT

In our country around 2.78% of peoples are not able to speak (dumb). Inability to speak is considered to be true disability. People with this disability use different modes to communicate with others, there are n number of methods available for their communication one such common method of communication is sign language.
We proposed a new technique called sign to speech converter for dumb people. This system is based on the flex sensor. Sign language allows people to communicate with human body language; each word has a set of human actions representing a particular expression. Their communications with others are only using the posture of their fingers.

CONTENTS

Introduction:

Sign language is a system of communication using visual gestures and signs, as used by deaf and dumb people. There are various categories in the sign language like ISL (Indian Sign Language), ASL (American Sign Language), BSL (British Sign Language) and etc... But none of the sign languages are universal or international. A person should know the sign language to understand the language; this becomes complicated when a person who has inability to speak or hear wants to convey something to a person or group of persons, since most of them are not familiar with the sign language. The communication between a dumb and hearing person poses to be an important disadvantage compared to communication between blind and ancient visual people. The blind people can speak freely by implies that of ancient language whereas the dumb have their own manual-visual language referred to as language. Language is also a non-verbal form of intercourse that's found among deaf communities at intervals the planet. A dumb communication interpreter is also a tool that interprets the hand gestures to sensibility speech. A gesture in associate degree extremely language is also a certain movement of the hands with a particular kind created out of them.

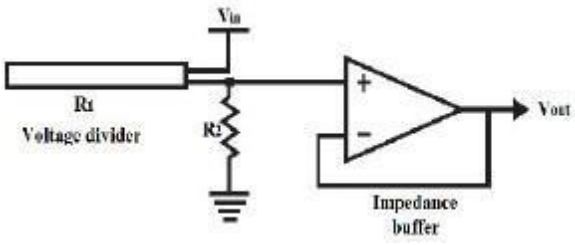
Gesture recognition is classed into a pair of main categories: vision based mostly and detector based. The disadvantage of vision based totally techniques includes advanced algorithms for process. Another challenge in image and video method includes varied lighting conditions, backgrounds and field of scan constraints and occlusion. The detector based totally technique provides larger quality. The primary aim of this project is to introduce an issue that will efficiently translate language gestures to sensibility voice. The interpreter makes use of a glove based totally technique comprising of flex detector. For each hand gesture created, a symptom is formed by the sensors appreciate the hand sign, the controller matches the gesture with pre-stored inputs. The device not exclusively interprets alphabets but cans even sort words exploitation created gestures. A training mode is gettable on the device therefore it fits every user and accuracy is inflated. The device will even be able to translate larger gestures that require single hand movement. Gesture recognition implies a method by that knowledge is collected from parts of the physical body (usually the hand) and processed to work out attributes like hand form, direction and speed of gesture being performed. There are presently 2 sorts of answer. Device based mostly techniques involve some variety of guide like a glove or glove like framework fitted with position trackers and flex sensors to live the condition and position of the hand. That message is kept in a database. Likewise, all templates are kept in the database. In the

real time the template database is fed into a microcontroller and the glove is fixed in their hand. For every action the motion sensors get accelerated and give the signal to the microcontroller. The microcontroller matches the motion with the database and produces the speech signal. The output of the system is using the speaker. By properly updating the database the dumb will speak like a normal person using the artificial mouth.

Components:

1) **Flex Sensor**:

Flex sensors are resistive carbon parts. When bent, the device develops a resistance output correlative to the bend radius. The variation in resistance is just about 10kΩ to 30kΩ. The device incorporates within the device employing a potential divider network. The potential divider is employed to line the output voltage across 2 resistors connected nonparallel. The electrical device and flex forms a
potential divider that divides the input voltage by a quantitative relation determined by the variable and glued resistors.



2) 10K Pull up Resistor:

Pull-up resistors are used in electronic logic circuits to ensure that inputs to logic systems settle at expected logic levels, if external devices are disconnected or high-impedance is introduced. They may also be used at the interface between two different types of logic devices, possibly operating at different power supply voltages. A pull-up resistor weakly "pulls" the voltage of the wire it is connected to towards its voltage source level when the other components on the line are inactive. Also used to pull up the voltage to 5V in order to eliminate external noise.

3) Speaker

Used to output the message in the form of voice.

4) SD-Card Shield (Configured *in SPI Protocol*):

Serial Peripheral Interface (SPI) is an interface bus commonly used to send data between microcontrollers and small peripherals such as shift registers, sensors and SD cards. It uses separate clock and data lines, along with a select line to choose the device you wish to talk to.
This is used to output the appropriate pre stored message in the SD card, the SD card shield is used to covert the WAV file (message) to TTL logic suitable for Arduino to read and is then output through the speaker.

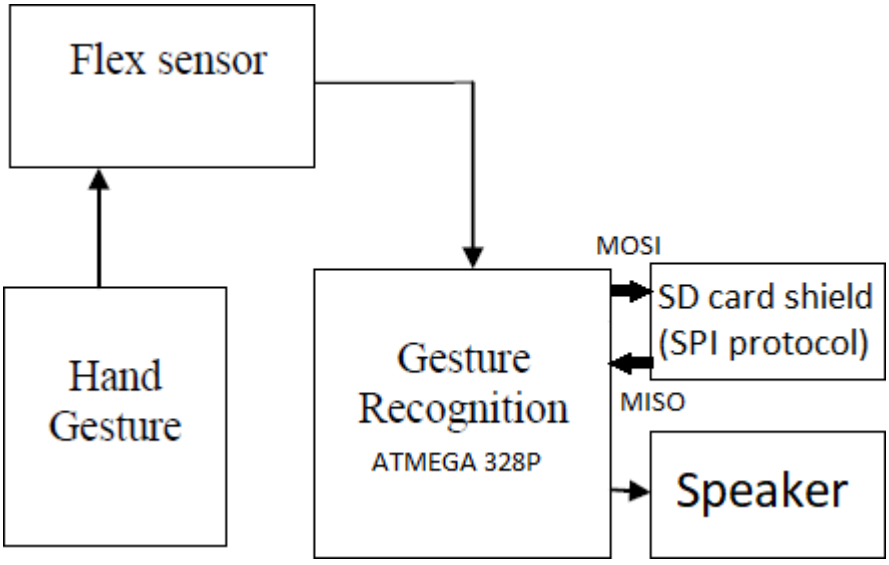
5) Arduino-UNO:

It is a microcontroller board. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. Here it is used to control the operation from the flex sensor(input) to the speaker(output).

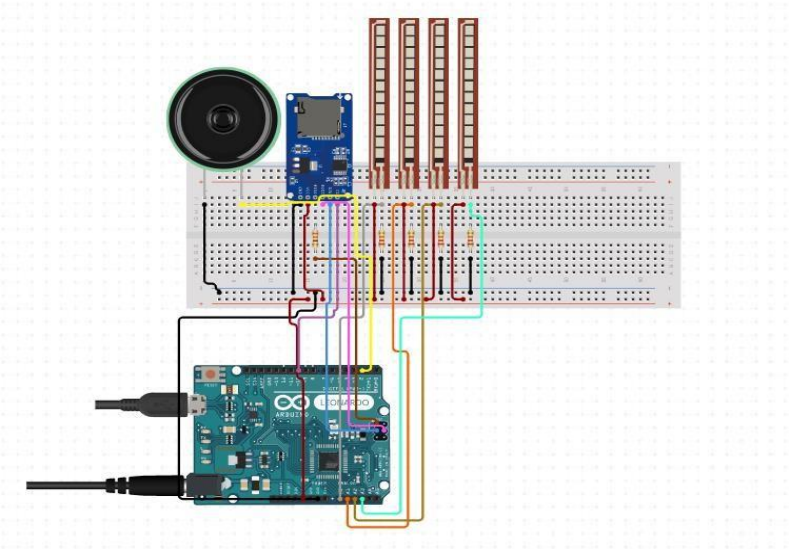
Working principle:

The movement of each finger is tracked using the flex sensor, which is fixed to the hand glove or glove like material. Each flex sensor gives the discrete PWM (pulse width modulation) signal, which corresponds to a value from 0 to 255 in decimal, based on the finger movement. In the database, the combination of each flex sensor is checked and appropriate sound message is selected from the SD card. All the sound messages are pre-recorded audio files in WAV format, stored in the SD card. The audio messages are be further used by the microcontroller

and finally, the appropriate sound message is passed through 2 PWM output ports, which is then fed to the speaker.



Circuit:



Code:

```
#include <SD.h>                    // need to include the SD library

//#define SD_ChipSelectPin 53 //example uses hardware SS pin 53 on Mega2560

#define SD_ChipSelectPin 4 //using digital pin 4 on arduino nano 328, can use other pins

#include <TMRpcm.h>            // also need to include this library...

#include <SPI.h>

TMRpcm tmrpcm; int

s1=A0;

int  s2=A1;

int  s3=A2;

int s4=A3;

int  flex1,flex2,flex3,flex4;

void setup() {

  tmrpcm.speakerPin = 9; //5,6,11 or 46 on Mega, 9 on Uno, Nano, etc

  Serial.begin(9600);

  if (!SD.begin(SD_ChipSelectPin)) { // see if the card is present and can be initialized:

    Serial.println("SD fail");

    return;    // don't do anything more if not

  }

  delay(1000);
```

```
  tmrpcm.play("intro.wav"); //the sound file "music" will play each time the arduino powers up, or is reset

 Serial.println("This is a Sign to speech converter demonstrated by Abhishek Rakshith Gowrav and Gokul");

  pinMode(s1,INPUT);

  pinMode(s2,INPUT);

  pinMode(s3,INPUT);

  pinMode(s4,INPUT);

}

void loop() {

  //reading of all the flex sensor value

  flex1=analogRead(s1);

  flex2=analogRead(s2);

  flex3=analogRead(s3);

  flex4=analogRead(s4);


 //to check whether the sensor value is set to minimum and maximum value

 //before which calculate min and max values in sensor check func change valsss accordingly

sensorcheck();


//maping of the flex sensor values

//retrace the first two values written in the map function ie..find out the min and max values of each sensor

int flexm1=map(flex1,924,1001,0,50);
```

```
int flexm2=map(flex2,0,200,100,150); int

flexm3=map(flex3,944,982,200,250); int

flexm4=map(flex4,837,930,300,350);

Serial.println(flexm1);

Serial.println(flexm2);

Serial.println(flexm3);

Serial.println(flexm4);

Serial.println(" ---------------------------------- ");

delay(500);

if((flexm1>=0)&&(flexm1<=15)&&(flexm2>=230)&&(flexm2<=250)&&(flexm3>=330)&&(flexm3<=350)&&(flexm4>=30)&&(flexm4<=45))

{Serial.println("hello How are you?");

tmrpcm.play("hello.wav");

delay(4000);}

if((flexm1>=0)&&(flexm1<=15)&&(flexm2>=200)&&(flexm2<=220)&&(flexm3>=330)&&(flexm3<=350)&&(flexm4>=30)&&(flexm4<=45))

{Serial.println("IM HUNGRY!");

tmrpcm.play("hungry.wav");

delay(4000);}

if((flexm1>=0)&&(flexm1<=15)&&(flexm2>=230)&&(flexm2<=250)&&(flexm3>=300)&&(flexm3<=320)&&(flexm4>=70)&&(flexm4<=80))

{Serial.println("I am in Danger");

tmrpcm.play("emerg.wav");

delay(4000);}

if((flexm1>=0)&&(flexm1<=15)&&(flexm2>=390)&&(flexm2<=400)&&(flexm3>=400)&&(flexm3<=410)&&(flexm4>=70)&&(flexm4<=80))
```

```
{Serial.println("I need water");
tmrpcm.play("water.wav");
delay(4000);}
}
void sensorcheck()
{
  if(flex1<924)
  flex1=924;
  if(flex1>1000)
  flex1=1000;

  if(flex2<0)
  flex2=0;
  if(flex2>200)
  flex2=200;
  if(flex3<944)
  flex3=944;
  if(flex3>982)
  flex3=982;
  if(flex4<837)
  flex4=837;
  if(flex4>930)
  flex4=930;
 }
```

System functionality:

When power is ON, the position and orientation of hand Is obtained from the data glove that consists of four Flex sensors on fingers (Index, middle, ring, and little), atmega 328P microcontroller (Arduino uno) and Speaker. Flex sensors can measure the bend of the four fingers when making a sign. When the user performs a gesture/letter and press a button, signals coming from the sensors are then captured
by the microcontroller which convert the analog signals (PWM) to digital values through its 8-channel ADC. These values are formatted into a simple state matrix: four values for the Flex sensors. Each level is represented by a value between 0 and 255; an interval of ± 3 levels should be taken into consideration in case the user could not keep his hand steady.

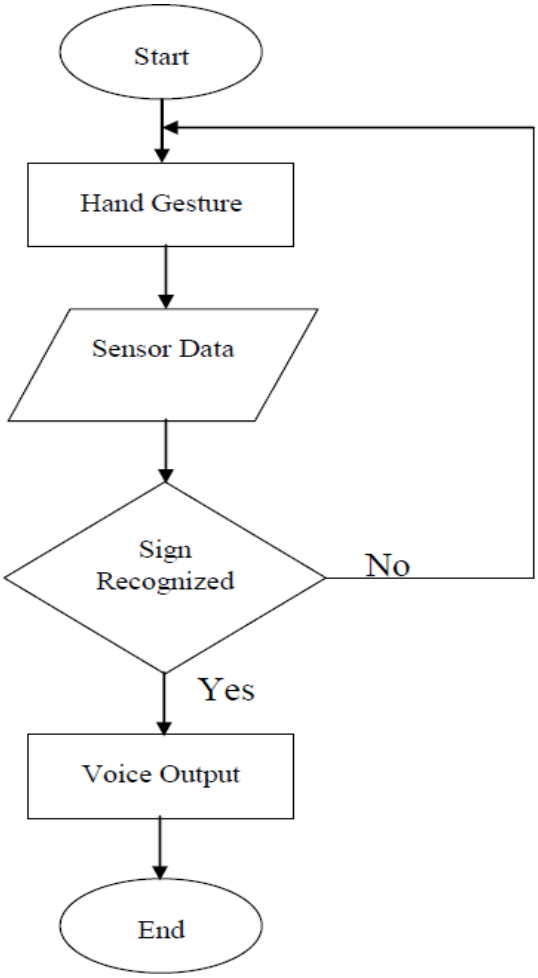


Fig. System flow

Reference table (values of flex sensor):

Message	Index	Middle	Ring	Little
Hello, how are you?	0-15	230-250	330-350	30-45
I'm Hungry	0-15	200-220	330-350	30-45
I am in Danger	0-15	230-250	300-320	70-80
I need water	0-15	390-400	400-410	70-80

Conclusion:

This project has been developed considering the need for low cost, the equipment is compact, simple in design and can be practically used anywhere. Sign language is a very useful to ease the communication between the deaf or mute community and the normal people. This project aims to overcome the communication gap between the deaf or mute community and the normal world.