SIGN LANGUAGE ASSISTANCE

ECET 400-102
Professor Blinder

https://www.istockphoto.com/vector/vector-deaf-mute-sign-language-character-gesture-gm1148738497-310315021

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MEET THE TEAM

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BACKGROUND

- According to World Health Organization (WHO), ~466 million people are experience disabling hearing loss (greater than 40dB)
- By 2050, projected to surpass 900 million individuals affected
- Of those effected, ~32 million are children and resources are not introduced early

https://coloradoearcare.com/is-hearing-loss-regenerative/

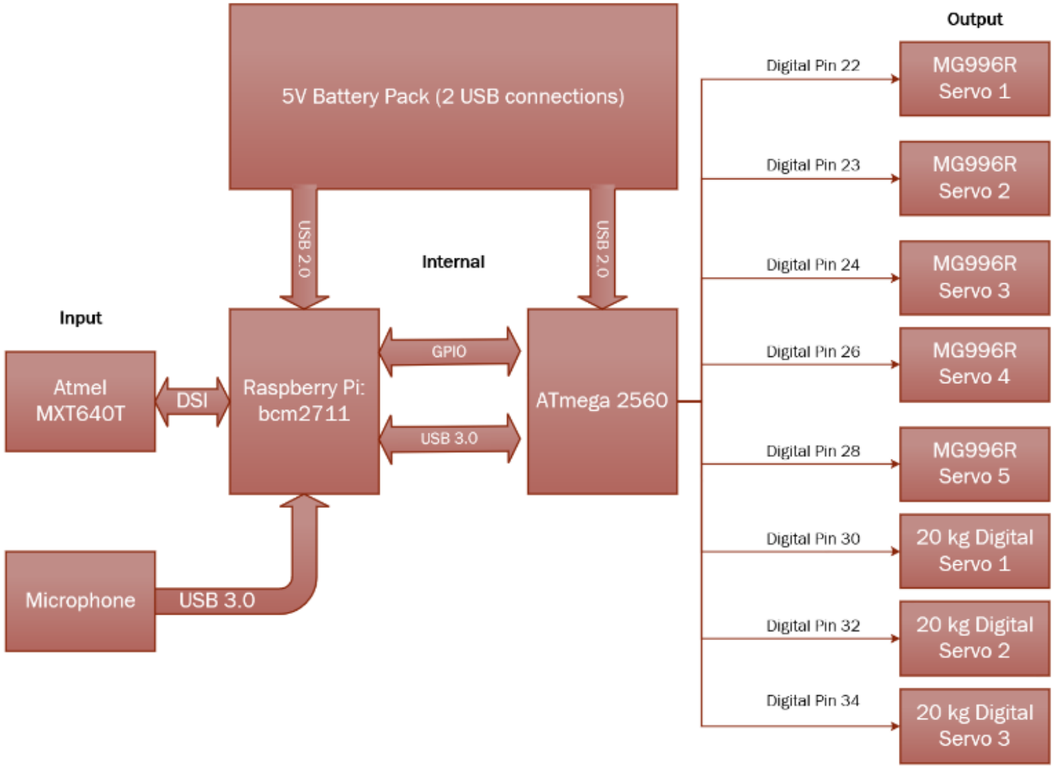
PURPOSE OF THE PROJECT

Design, create, and code an interactive tool to expose children and individuals to American Sign Language (ASL) at an introductory level

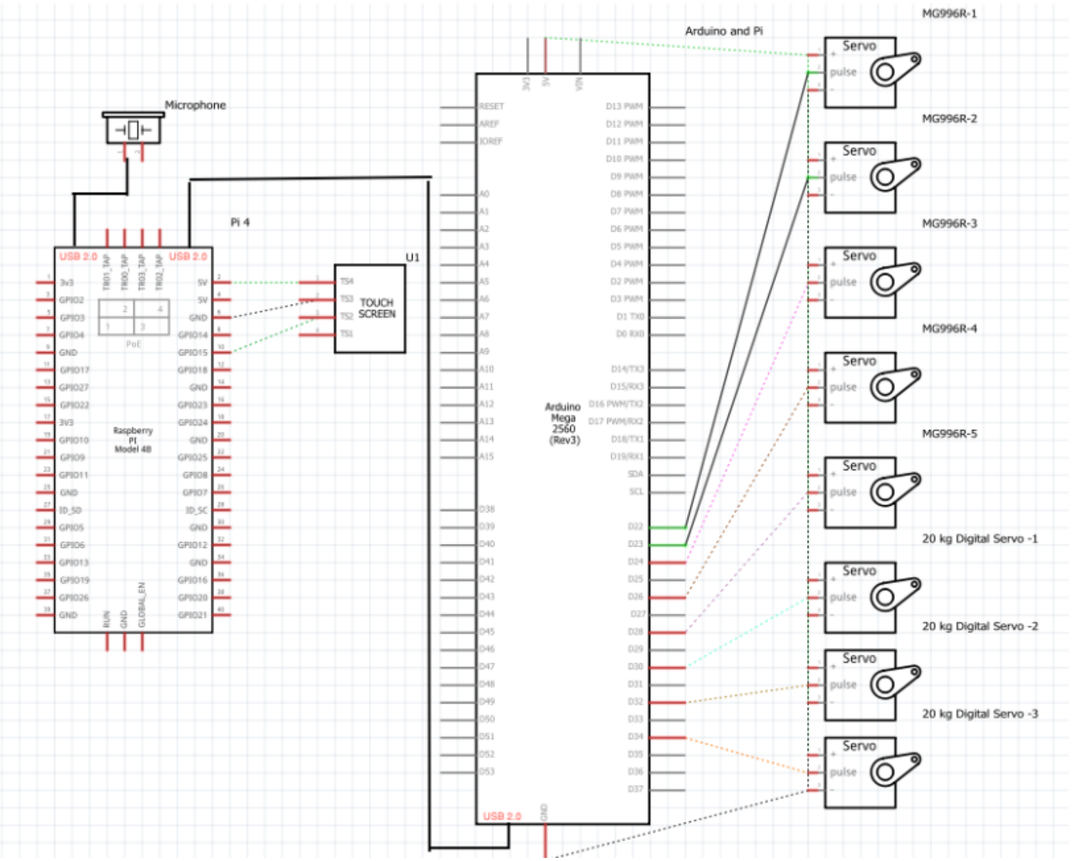
AGENDA

1. High level documentation
2. Summary of setup
3. Physical setup and software
4. Demonstration
5. Setbacks
6. Future Enhancements

SECOND LEVEL BLOCK DIAGRAM



SCHEMATIC OF ARDUINO/SERVO WIRING



SET UP OF RASPBERRY PI

Hardware Setup

- Power Supply for adruino mega
- Microphone
- USB connector (Serial Communication)

Software Setup

- Python
- Terminal
- Internet Connection

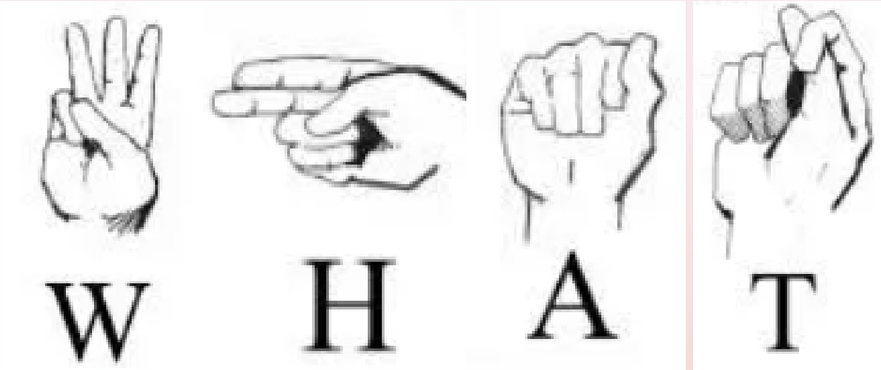
SET UP OF ARDUINO MEGA

Hardware Setup

- USB connector (Serial Communication)
- Breadboard and Wires

Software Setup

- Arduino IDE
- Terminal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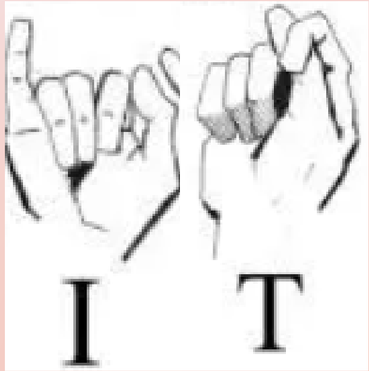
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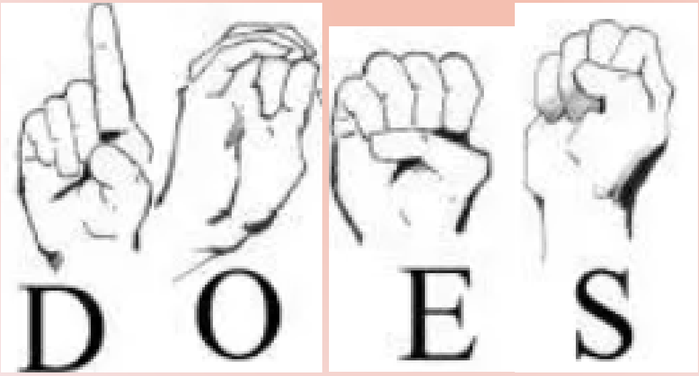
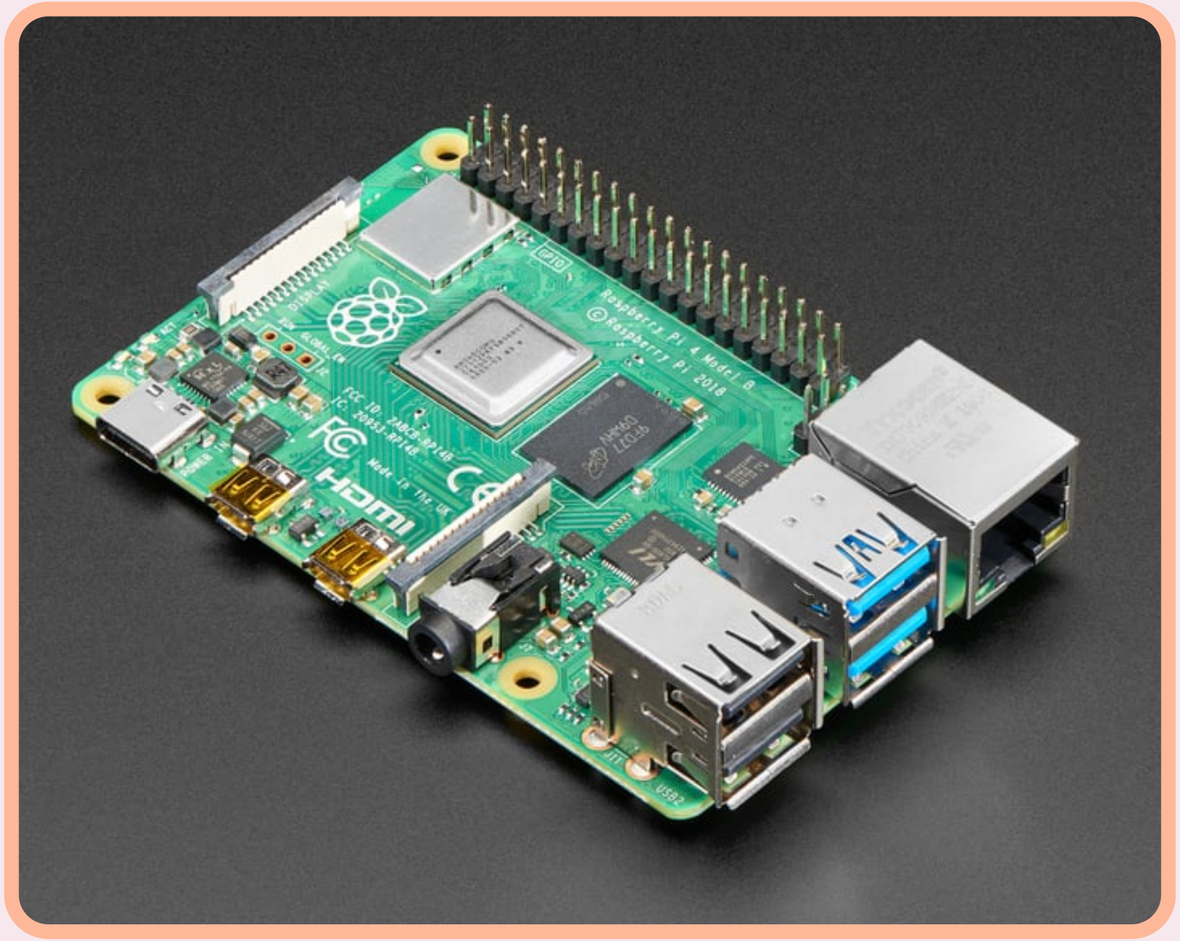

D O E S

RASPBERRY PI

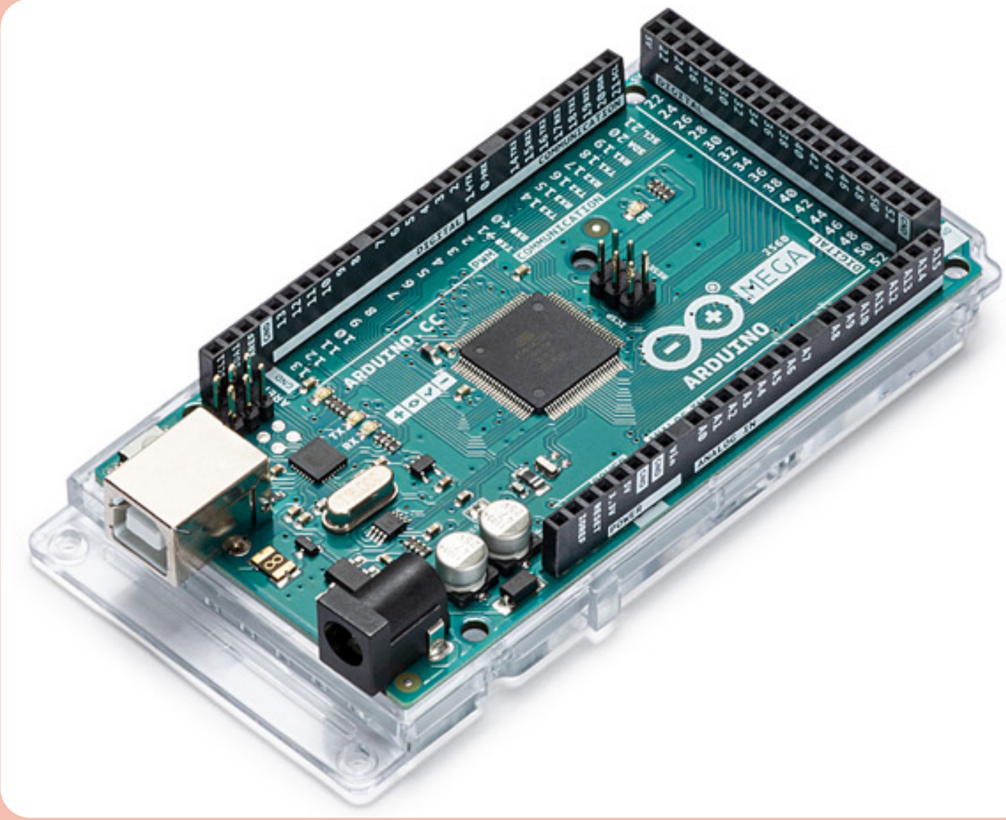


https://www.adafruit.com/product/4292

CODE ON RASPBERRY PI

```
#Establish button functions

def rbp():          #Function for record button -> Display recording -> Record mic -> Save as .wav file -> Use google to translate->send to arduino
    ev.set("Recording...") #display recording in the text box
    root.update() #to force the recording text to appear
    #set .wav file to save in the same folder as code for later easy access
    folder_path = os.path.dirname(os.path.abspath(__file__))
    filepath = os.path.join(folder_path, f"t.wav")
    recording = sd.rec(int(dur*srate), samplerate = srate, channels= chan, dtype = 'int16')
    sd.wait() #wait till recording finishes
    with wave.open(filepath, 'wb') as wavefile: #save wav file to the same spot as the code for easy reading
        wavefile.setnchannels(chan)
        wavefile.setsampwidth(2)  # 16-bit audio found works best
        wavefile.setframerate(srate)
        wavefile.writeframes(recording.tobytes())

    ev.set("Converting...")
    root.update()

    # Read .wav file saved earlier using the listen fuction in speech recognition to load file
    with s.AudioFile(filepath) as source:
        audio_t = r.listen(source)
```

ARDUINO MEGA



https://www.dfrobot.com/product-358.html

CODE ON ARDUINO MEGA

```
void letA(){
  Serial.println("Signing A");
  pinky.attach(22);
  pinky.write(0);
  delay(2000);
  pinky.detach();
  ring.attach(23);
  ring.write(0);
  delay(2000);
  ring.detach();
  middle.attach(24);
  middle.write(0);
  delay(2000);
  middle.detach();
  pointer.attach(26);
  pointer.write(0);
  delay(2000);
  pointer.detach();
  thumb2.attach(30);
  thumb2.write(150);
  delay(2000);
  thumb2.detach();
  thumb.attach(28);
  thumb.write(150);
  delay(2000);
  thumb.detach();
  delay(2000);
  resetAll();
```

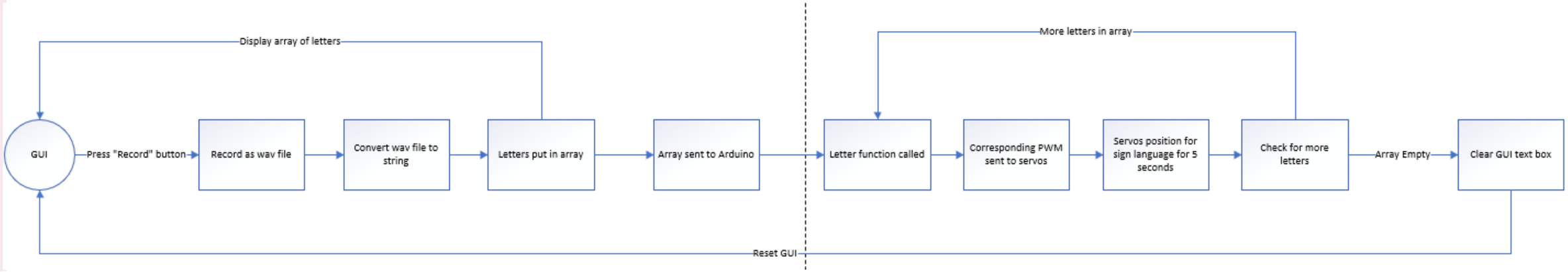
```
void ily(){
  Serial.println("Signing: I love you");
  ring.attach(23);
  ring.write(0);
  delay(2000);
  ring.detach();
  middle.attach(24);
  middle.write(0);
  delay(2000);
  middle.detach();
  delay(2000);
  resetAll();

}
```

CODE ON ARDUINO MEGA

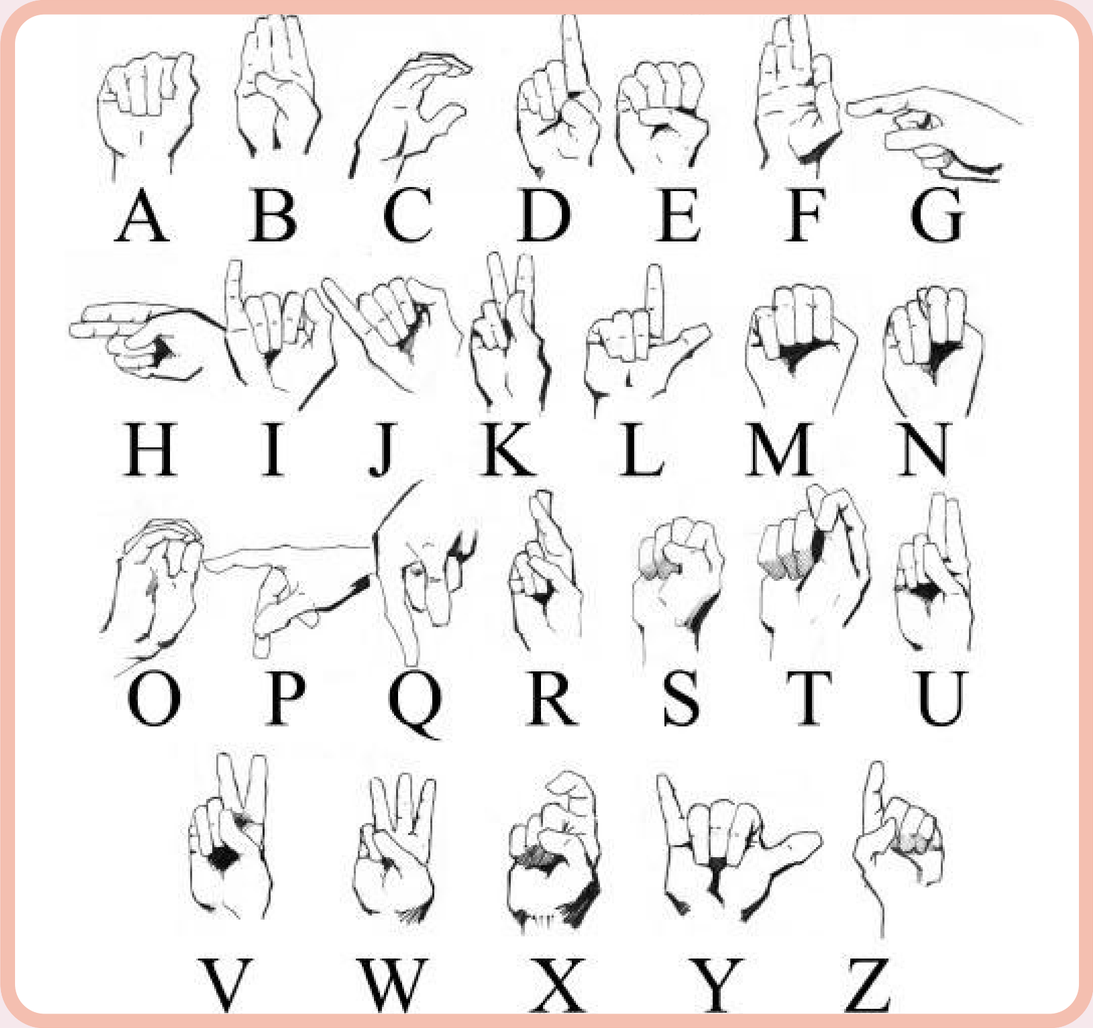
```
void loop(){
  if (Serial.available() > 0){  // if com port is open then take the letter and print
    char il = Serial.read();

    Serial.print("Received: ");
    Serial.println(il);
    //store letter in array as long as lenght is acceptable
    if (charnum < maxchar -1){
      stext[charnum] = il;
      charnum ++;

    }
  }
  if (charnum == maxchar - 1 || Serial.available() == 0) { //print entire array as test
    // Print the full array
    Serial.println("Transmitting text:");
    Serial.println(stext);
    inputstr = stext;
    inputstr.trim(); // takes off end space
    Serial.println(inputstr);
```

```
  else{
    //loop for traversing array
    for(int i = 0; i <= charnum; i++){
      ct = stext[i];
      findletter(ct);
    }
  }
    // Reset charnum  and array to prepare for receiving new text
    for(int i = 0; i < charnum; i++){
      stext[i] = '\0';
    }
    charnum = 0;
  }
  inputstr = "";
```

PROCESS FLOW DIAGRAM



DEMONSTRATION



COSTS

Hardware	Unit	Price
20kg Servo Motor	3	$40.77
MG 996R Servo Motor	6	$27.99
3D Printer Filament	2	$29.99
Microphone	1	$16.99
Touch Screen	1	$68.99
Fishing Wire	1	$5.99
Glue gun & Glue Stick	1	$9.99
3.3V/5V Power Supply Module	5	$10.99
Raspberry Pi	1	$76.49
Arduino Mega	1	$48.90
Bread Board	1	$8.99
Total		$345.09

SETBACKS

- Lack of power in servo motors
- Pieces snapping
- API issue
- Speak slowly for clear recognition

FUTURE ENHANCEMENTS

- Increase recording time
- Reduce delay of servo motors
- Increase hand mobility
- Typing feature
- Expand beyond ASL

QUESTIONS?

THANK YOU!

https://www.istockphoto.com/vector/vector-deaf-mute-sign-language-character-gesture-gm1148738498-310315023

REFERENCES

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