SPEAKING SYSTEM FOR MUTE PEOPLE

A Report submitted in partial fulfilment of the requirements to complete Term Work& Practical work of Project Based Learning (PBL) in the department of

E&TC ENGINEERING

As prescribed by

SAVITRIBAI PHULE PUNE UNIVERSITY

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Thank you all!

ABSTRACT

One of the standard sign language techniques is the use of hand gestures. The ability of mute people to communicate with others is highly limited. This project aims to facilitate the diagnosis process of the mute patients via using hand gesture recognition system that housed in a right-hand glove and contain five flex sensors for each finger, the system is designed to recognize eleven Arabic sign language letters that represent different phrases, converted to audio to help the doctor to make the right diagnosis, The system will compare the identified signal with stored data when it's matched an mp3 audio file will be played as an output. This recognition system is designed to identify eleven hand gesture-already familiar to the patients- each of these gestures represent a phrase that is an answer to question asked frequently when seeing the general practitioner, the system has converted all of the sample successfully with accuracy of 90%

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CHAPTER 1
INTRODUTION

INTRODUCTION

The need of this system is to give output in day to day life for “Image Processing Based Sign to Speech Converter for Dumb People” using PCA algorithm. It will explain the aim and whole declaration for the evaluation of system. It will also explain system constraints, interface and interactions with other external applications. An attempt has also been made to explore about the need and motivation for interpreting ISL, which will provide opportunities for hearing impaired people in industry.

The aim of the proposed project is to overcome the challenge of skin color detection for natural interface between user and machine. This project is developed for the physically impaired people and would be beneficial as they can communicate with everyone. In our system a webcam is placed in front of the physically impaired person.

The physically impaired person will place a finger with particular action in front of the flex sensor .When he makes the gestures, the sensor will capture the exact positions of the fingers and perform image processing using principle component analysis algorithm. The co-ordinates captured will be mapped with the one previously stored and accordingly exact phase angle from the database will be identified.

BACKGROUND

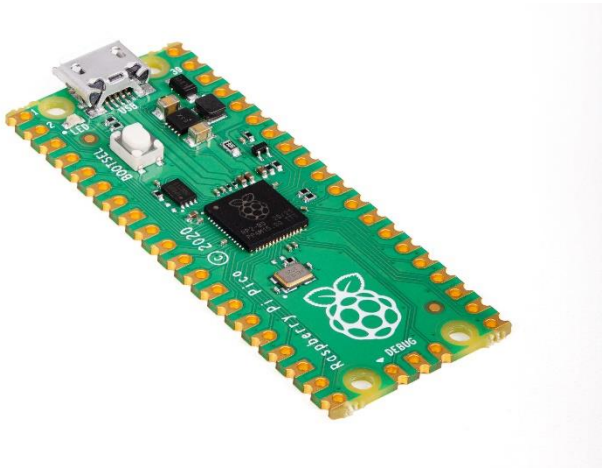
Gestures are considered as the most natural expressive way for communications. Researches in the field of sign language recognition has made significant advances in recent years. The present achievements provide the basis for future applications with the objective of supporting the integration of mute people. Translation systems, for example, could facilitate communication between mute people and other people in public situations. In recent years, many researchers and bioengineers have made significant strides in facilitating communication between mute people and other people using various means of sign language recognition and translation. Fortunately, most of these projects have been done to translate the sign language into text output, now several research papers have been published using audio speech as output.

HARDWARE REQUIRED

Types of components required-

a) Raspberry pi pico
b) Flex sensor
c) ISD1820 voice module
d) Jumper wires

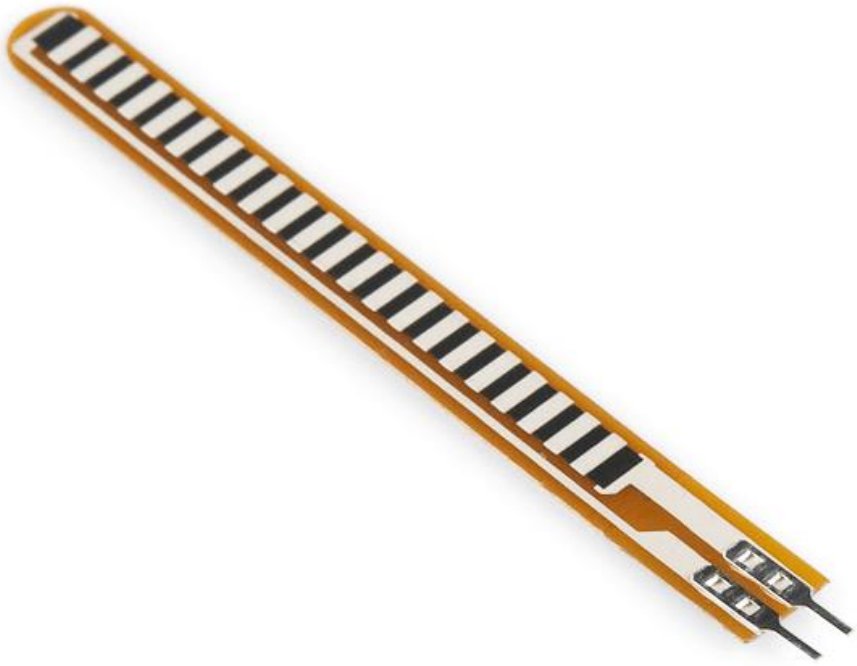
a) Raspberry pi pico-



1.1 Raspberry pi pico

The Raspberry Pi Pico is a microcontroller board developed by the Raspberry Pi Foundation. It was announced in January 2021 and marked the Foundation's first foray into the world of microcontrollers. The Raspberry Pi Pico is designed to provide an affordable and accessible platform for beginners and experienced makers alike to explore embedded electronics and programming.

b)Flex sensor-



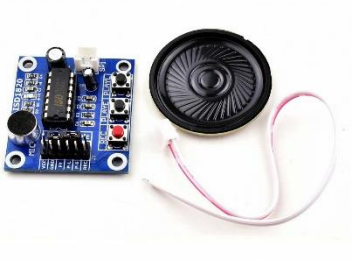
1.2 Flex sensor

Flex sensors are devices that change resistance based on the amount of bend or flex applied to them. They are commonly used in various applications such as robotics, wearable technology, medical devices, and musical instruments to detect the degree of bending or movement in a particular object or part of the body.

Working Principle: Flex sensors typically consist of a flexible substrate material, such as plastic or rubber, embedded with a conductive material, usually carbon or conductive ink. As the sensor bends, the distance between the conductive traces changes, altering the resistance of the sensor. This change in resistance can then be measured to determine the degree of bend.

Construction: Flex sensors come in various shapes and sizes, but they often have a long, thin strip shape, making them suitable for applications where flexibility is required. They can be integrated into gloves, clothing, or attached to joints to measure movement.

C) ISD1820 voice module-



1.3 Voice module

The ISD1820 Voice Recording and Playback Module is a commonly used integrated circuit (IC) module designed for recording and playing back sound. It is popular among hobbyists and electronics enthusiasts for various projects requiring voice recording and playback capabilities. Here are some key points about the ISD1820 Voice Module:

Features:

Voice Recording: The module allows users to record audio through an onboard microphone or an external audio input.

Playback: Recorded audio can be played back through an onboard speaker or an external audio output.

Non-volatile Storage: The recorded audio is stored in non-volatile memory (EEPROM), meaning it remains stored even when power is removed.

Control Pins: The module typically has control pins for recording, playback, and erasing recorded audio.

Low Power Consumption: It operates at low power, making it suitable for battery-powered applications**.**

c) Jumper wires-

1.4 Jumper wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two pointsto each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power.

SOFTWARE REQUIRED

a) thonny ide-

1.5 Thonny ide

Thonny is an Integrated Development Environment (IDE) specifically designed for beginners learning to program in Python. It provides a simple and clean interface that focuses on easing the learning curve for new programmers while still offering useful features for more advanced users. Key features of Thonny include:

Simple Interface: Thonny has a user-friendly interface with minimal distractions, making it ideal for beginners.

Code Editor: It comes with a code editor that supports syntax highlighting, code completion, and automatic indentation to assist users in writing Python code.

Integrated Python Shell: It features an integrated Python shell where users can execute Python code interactively and see the results immediately.

SPECIFICATIONS AND FEATURES

1) Gesture Recognition: The system should be able to accurately recognize hand gestures made by the user. This involves using computer vision algorithms to analyze video input from a camera and identify specific hand movements.

2) Machine Learning Models: Utilizing machine learning algorithms to train models on large datasets of hand gestures, enabling the system to recognize a wide range of gestures with high accuracy.

3) Natural Language Processing (NLP): Once gestures are recognized, the system should translate them into spoken language. NLP algorithms can be used to convert the gestures into text, which can then be synthesized into speech using text-to-speech (TTS) technology.

4) Customizable Vocabulary: Users should be able to customize the vocabulary of the system to include words and phrases that are relevant to their daily communication needs.

5) Real-Time Feedback: Providing real-time feedback to the user, such as visual cues or auditory prompts, to confirm that their gestures have been correctly recognized.

6) Accessibility Features: Ensuring that the system is accessible to users with different levels of mobility and dexterity, potentially by incorporating alternative input methods such as voice commands or touchscreen interfaces.

7) Adaptability: The system should be adaptable to different environments and lighting conditions to maintain accuracy in gesture recognition.

8) Offline Functionality: Providing offline functionality to ensure that the system can be used even in areas with limited internet connectivity.

9) Privacy and Security: Implementing measures to protect the privacy and security of user data, particularly sensitive information such as communication logs.

10) Integration with Other Technologies: Integrating the speaking system with other technologies such as mobile devices or smart home assistants to enhance its functionality and usability.

11) User-Friendly Interface: Designing a user-friendly interface that is easy to navigate and understand, particularly for users who may have limited experience with technology.

CHAPTER 2
LITERATURE SURVEY

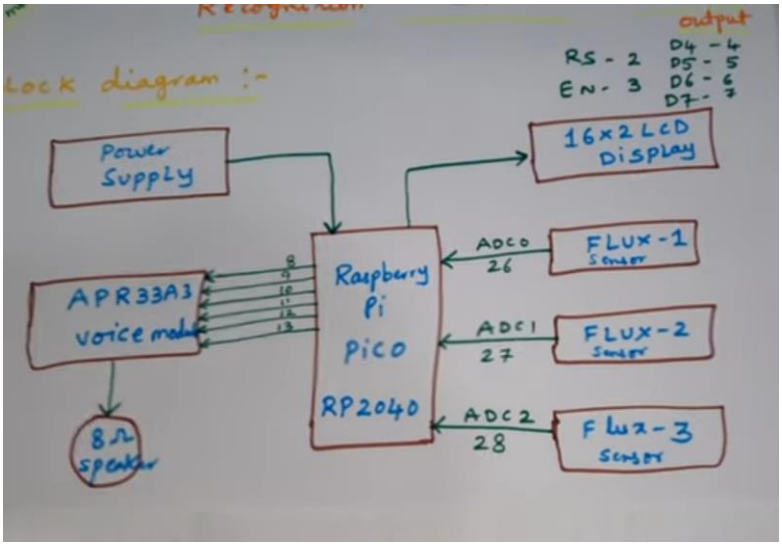
LITERATURE SURVEY

Speech disorders or speech impairments are a type of communication disorder in which normal speech is disrupted. This can mean stuttering, lisps, etc. Someone who is unable to speak due to a speech disorder is considered mute It may not be a permanent condition, depending on the cause, which might be physical, medical, organic, psychological, developmental, neurological or traumatic.

Gestures are considered as the most natural expressive way for communications. Researches in the field of sign language recognition has made significant advances in recent years. The present achievements provide the basis for future applications with the objective of supporting the integration of mute people. Translation systems, for example, could facilitate communication between mute people and other people in public situations. In recent years, many researchers and bioengineers have made significant strides in facilitating communication between mute people and other people using various means of sign language recognition and translation. Fortunately, most of these projects have been done to translate the sign language into text output, now several research papers have been published using audio speech as output. But unfortunately, most of these projects were made to interpret conversations of everyday life and none of them were made to help the mute patients. Diagnosis is known to be a critical phase in the healing process.

CHAPTER 3
DESIGN AND DEVELOPMENT

Block diagram and brief explanation



3.1 Block Diagram of Speaking System

The resistance that the sensor outputs changes accordingly to the bend level that exists in the flex senxor.The sensor outputs a resistance that is proportional to the value of bend

In other words, the relationship between resistance and bend in sensor is the following:The greater the bend, the greater the output resistance

The lower the bend, the lower the output resistance

The output can be an analog signal (A0) that can be read with an analog input of the raspberry pico or a digitaloutput (D0) that can be read with a digital input of the raspberry pico

ALGORITHM

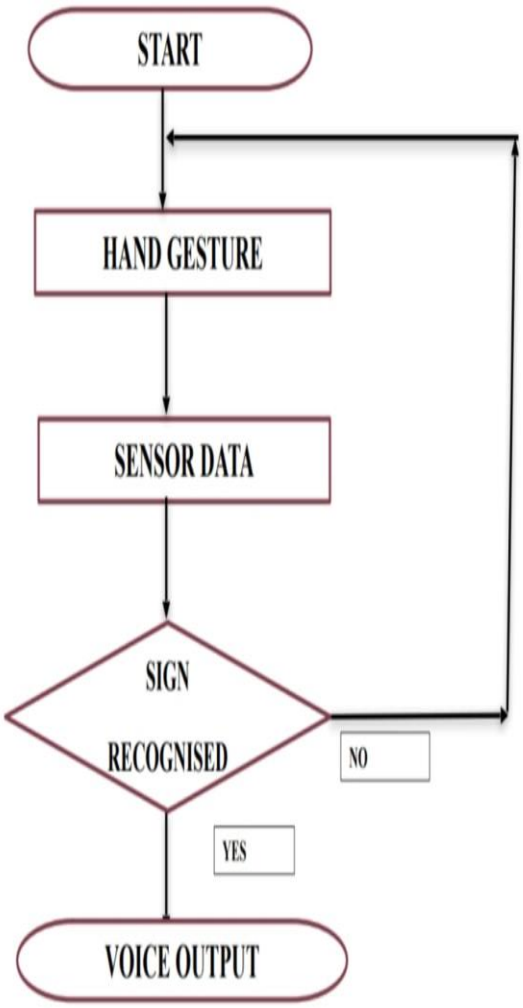
```
import machine
import utime

# Define pin numbers for flex sensors
FLEX_SENSOR_1_PIN = 26  # Replace 0 with the actual pin number
FLEX_SENSOR_2_PIN = 27 # Replace 1 with the actual pin number
FLEX_SENSOR_3_PIN = 28 # Replace 2 with the actual pin number

# Define pin numbers for LCD
LCD_RS_PIN = 2  # Replace 3 with the actual pin number
LCD_EN_PIN = 3  # Replace 4 with the actual pin number
LCD_D4_PIN = 4  # Replace 5 with the actual pin number
LCD_D5_PIN = 5  # Replace 6 with the actual pin number
LCD_D6_PIN = 6  # Replace 7 with the actual pin number
LCD_D7_PIN = 7  # Replace 8 with the actual pin number

# Define pin numbers for voice module
VOICE_MODULE_PINS = [11,12,14,15,16,17]  # Replace with actual pin numbers

# Initialize flex sensors
flex_sensor_1 = machine.ADC(FLEX_SENSOR_1_PIN)
flex_sensor_2 = machine.ADC(FLEX_SENSOR_2_PIN)
flex_sensor_3 = machine.ADC(FLEX_SENSOR_3_PIN)
```

```
# Initialize LCD
lcd_rs = machine.Pin(LCD_RS_PIN, machine.Pin.OUT)
lcd_en = machine.Pin(LCD_EN_PIN, machine.Pin.OUT)
lcd_d4 = machine.Pin(LCD_D4_PIN, machine.Pin.OUT)
lcd_d5 = machine.Pin(LCD_D5_PIN, machine.Pin.OUT)
lcd_d6 = machine.Pin(LCD_D6_PIN, machine.Pin.OUT)
lcd_d7 = machine.Pin(LCD_D7_PIN, machine.Pin.OUT)

# Initialize voice module pins
voice_pins = [machine.Pin(pin, machine.Pin.OUT) for pin in VOICE_MODULE_PINS]

# Define LCD commands
LCD_CLEAR = const(0x01)
LCD_CURSOR_HOME = const(0x02)
LCD_DISPLAY_ON = const(0x0C)
LCD_4BIT_MODE = const(0x28)

def lcd_command(data):
    lcd_rs.off()
    lcd_d7.value(data & 0x08)
    lcd_d6.value(data & 0x04)
    lcd_d5.value(data & 0x02)
    lcd_d4.value(data & 0x01)
    lcd_enable_pulse()

def lcd_enable_pulse():
    lcd_en.off()
    utime.sleep_ms(1)
    lcd_en.on()
    utime.sleep_ms(1)

def lcd_init():
    lcd_command(0x33)
    lcd_command(0x32)
    lcd_command(LCD_4BIT_MODE)
    lcd_command(LCD_DISPLAY_ON)
    lcd_command(LCD_CLEAR)
    lcd_command(LCD_CURSOR_HOME)

def lcd_write(message):
    lcd_command(LCD_CLEAR)
    for char in message:
        lcd_rs.on()
        lcd_d7.value(ord(char) & 0x80)
        lcd_d6.value(ord(char) & 0x40)
        lcd_d5.value(ord(char) & 0x20)
        lcd_d4.value(ord(char) & 0x10)
        lcd_enable_pulse()
        lcd_rs.on()
        lcd_d7.value(ord(char) & 0x08)
```

```
lcd_d6.value(ord(char) & 0x04)
        lcd_d5.value(ord(char) & 0x02)
        lcd_d4.value(ord(char) & 0x01)
        lcd_enable_pulse()

def trigger_voice_module(message):
    # Send message to LCD
    lcd_write(message)
    # Trigger voice module
    for pin in voice_pins:
        pin.on()
    utime.sleep(2)  # Play the sound for 2 seconds
    for pin in voice_pins:
        pin.off()

def send_message_over_serial(message):
    print("I Want To Say That:", message)
    # Implement serial communication here

def main():
    # Initialize LCD
    lcd_init()

    while True:
        # Read flex sensor values
        flex1_val = flex_sensor_1.read_u16()
        flex2_val = flex_sensor_2.read_u16()
        flex3_val = flex_sensor_3.read_u16()

        # Check combinations of flex sensor values
        if  flex1_val < 600 and flex2_val > 600 and flex3_val > 600:#1
            message = "I want water"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val > 600 and flex2_val < 600 and flex3_val > 600:#2
            message = "I am hungry"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val > 600 and flex2_val > 600 and flex3_val < 600:#3
            message = "I need help"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val < 600 and flex2_val < 600 and flex3_val > 600:#1,2
            message = "I am in pain"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val < 600 and flex2_val > 600 and flex3_val < 600:#1,3
            message = "Hello, Nice To Meet You"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val > 600 and flex2_val < 600 and flex3_val < 600:#2,3
```

```
            message = "Thank you"
            trigger_voice_module(message)
            send_message_over_serial(message)
        elif flex1_val < 600 and flex2_val < 600 and flex3_val < 600:#all
            message = "Please stop"
            trigger_voice_module(message)
            send_message_over_serial(message)


if __name__ == "__main__":
    main()
```

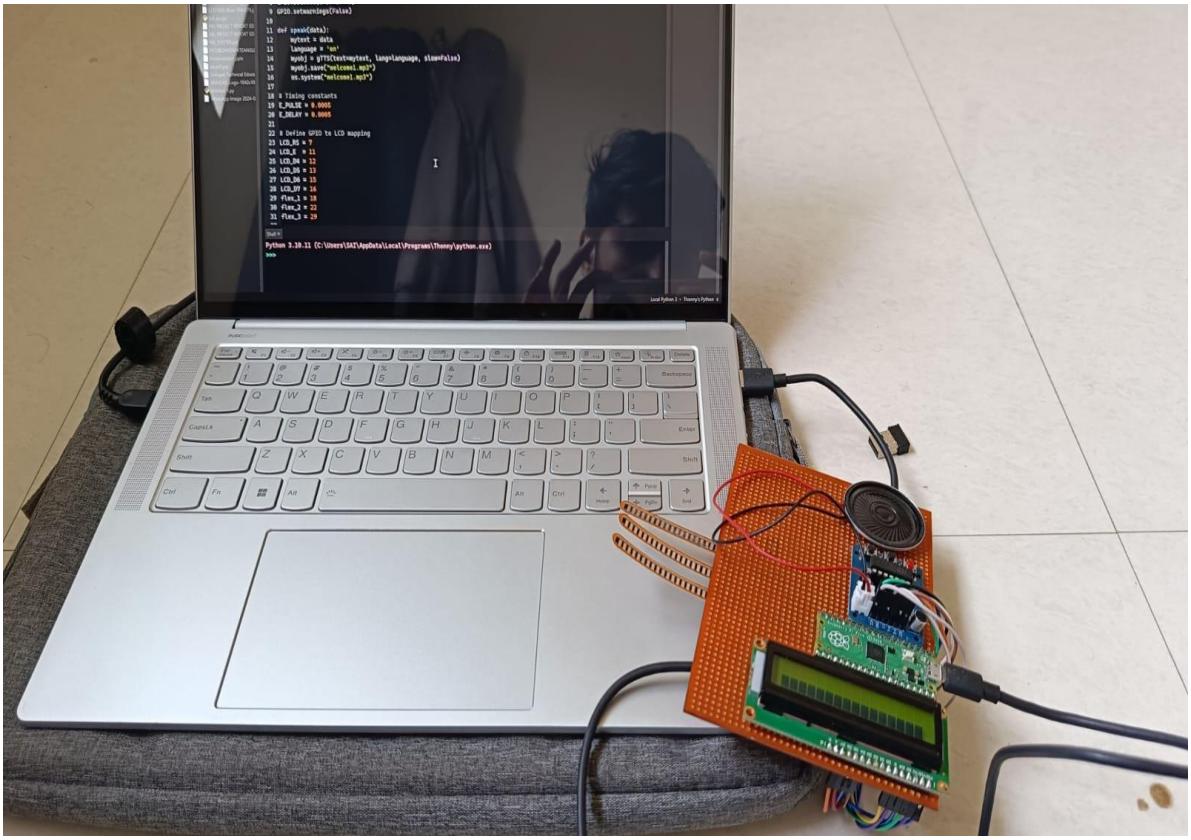
FLOWCHART



3.2 Flowchart

CHAPTER 4
RESULT

RESULTS



4.1 Result

CHAPTER 5
CONCLUSION

ADVANTAGES

- Low cost
- Compact systems
- Flexible to users
- It takes less power to operate system

APPLICATIONS

- Gesture recognition and conversion.
- As a translating device for Mute people.
- It can be used for Mobiles for SMS sending.
- Translation of sign language in many regional languages.

CONCLUSION

The following remarks could be the summary of the findings from this work.

- The design is more compatible and faster responsive when compared to existing design using PCA algorithm
- A responsive time of 2 to 3 seconds.
- More Compact and portable.
- Efficient communication between differently abled (deaf in this context) and normal people.
- Assign language involves different gestures and hand movement, improves small motor skills of differently abled

people.

- A mobile application can be built for the efficient use of the design and to make it user-friendly

FUTURE SCOPE

1.ENHANCING GESTURE RECOGNITION: Continuously improving the gesture recognition algorithm to achieve higher accuracy and reduce false positives.

2.EXPANDING VOCABULARY: Increasing the systems vocabulary to include a wider range of words and phrases for more comprehensive communication.