TEAM01

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Project ASL Translator

This project aims to allow for real-time communication between deaf and non-deaf people. This is done by creating a real-time American Sign Language (ASL) translator that converts ASL gestures into text. The translator will capture hand movements and translate them into text, displayed on an LCD screen, enabling non-ASL users to understand the message. Furthermore, we will implement speech recognition to allow the deaf user to understand what the non-deaf user says in a timely manner. By incorporating ASL to English translation as well as spoken English to written English translation, this system facilitates seamless interaction between deaf individuals and those unfamiliar with ASL.

01
Project Idea

Project Focus:

Bridging the communication gap between deaf individuals and those who do not know American Sign Language (ASL).

System Functionality:

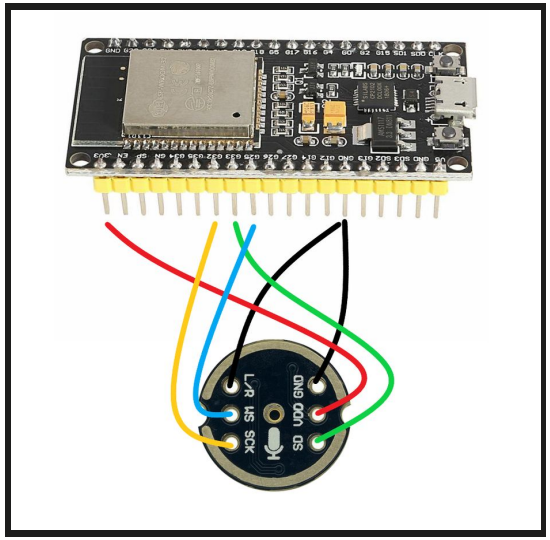
- Translates ASL gestures into text using gesture recognition sensors.
- Converts spoken English into written English for deaf individuals to understand conversations.

Technology Used:

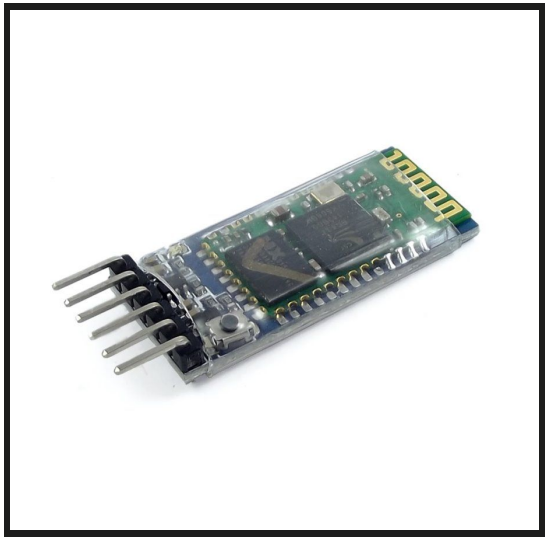
- Gesture recognition sensors interfaced with multiple Arduino microcontrollers.
- Display unit to show the translated text.

02

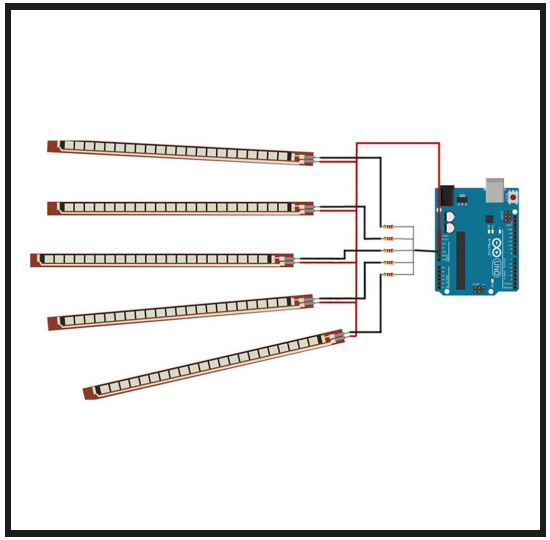
I/O Devices



INMP441 Microphone

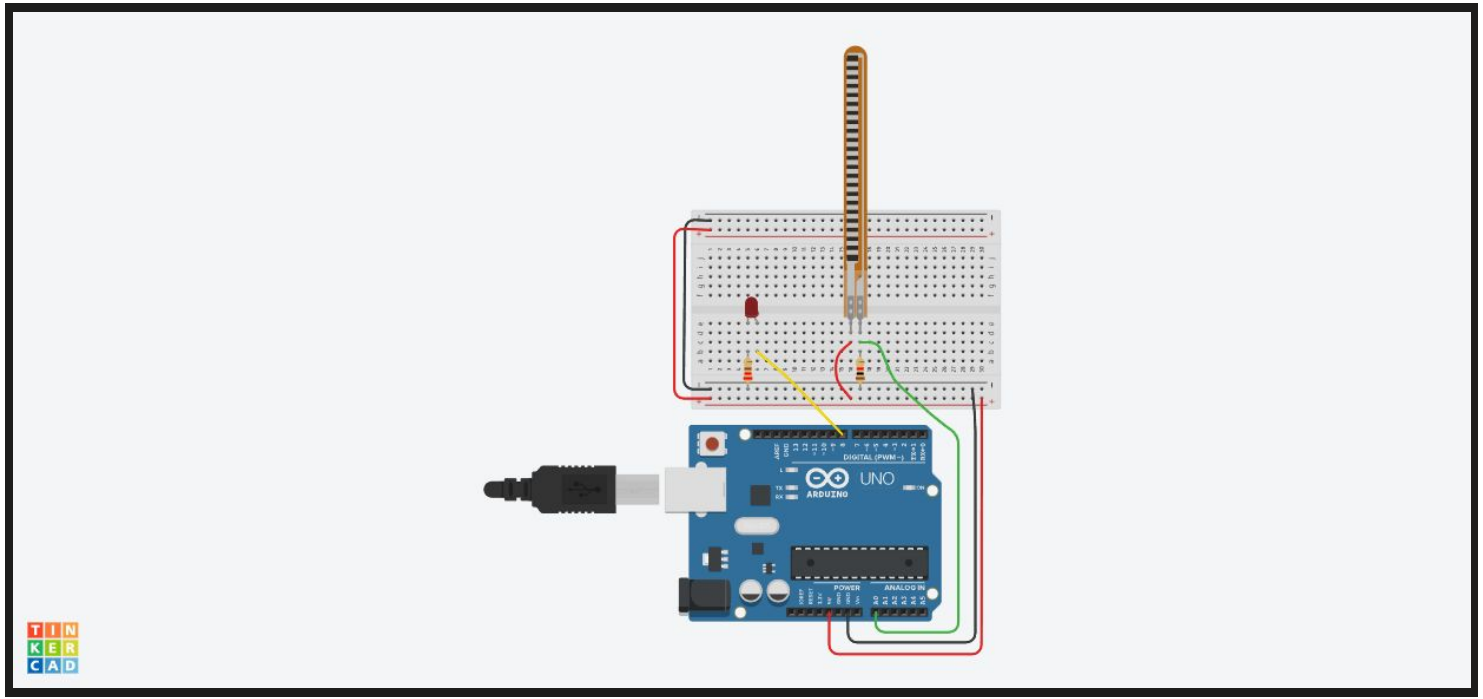


Bluetooth Mod. HC-06



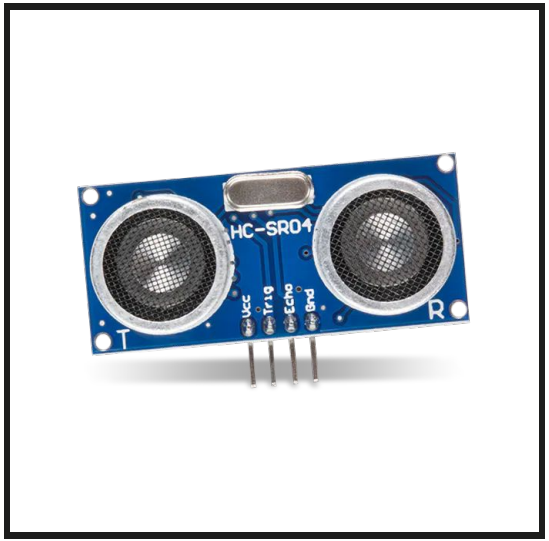
Flex Sensors

Push Buttons

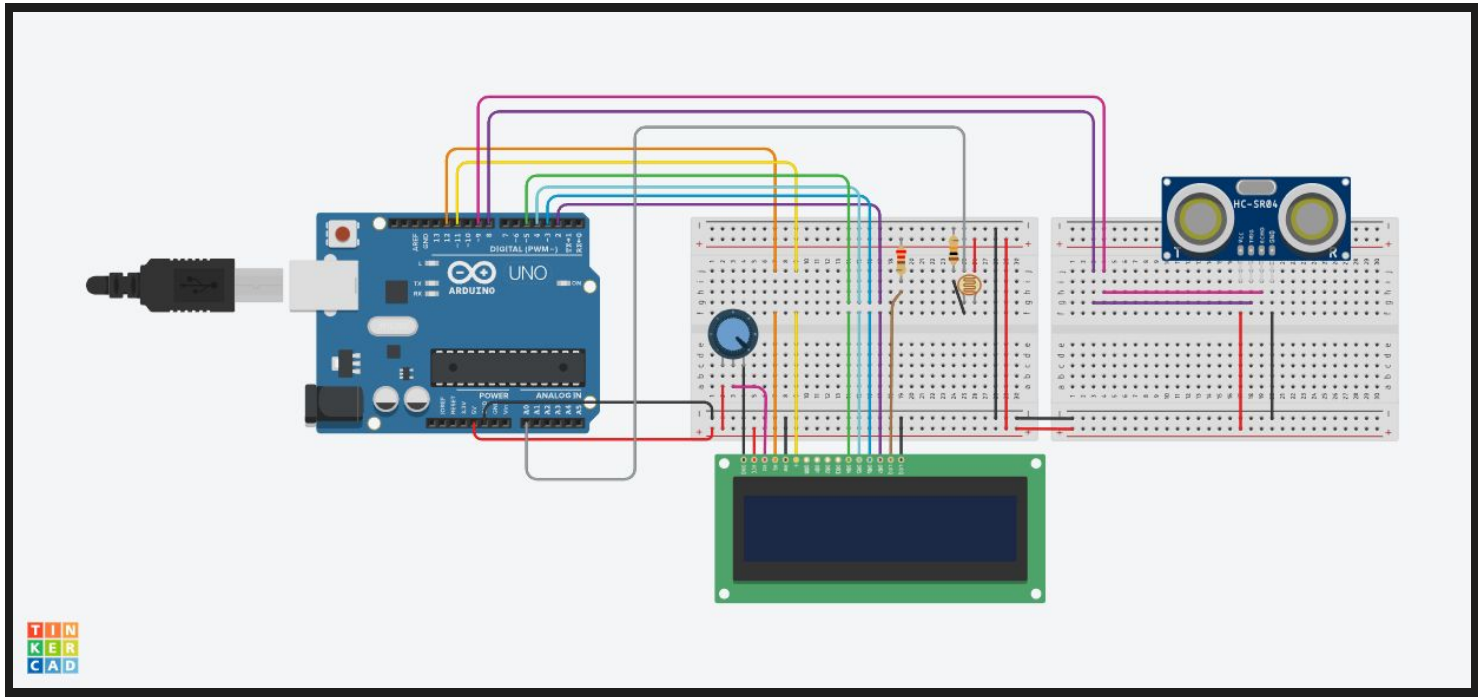


Flex Sensor Wiring Diagram

16x2 LCD



Ultrasonic Sensor

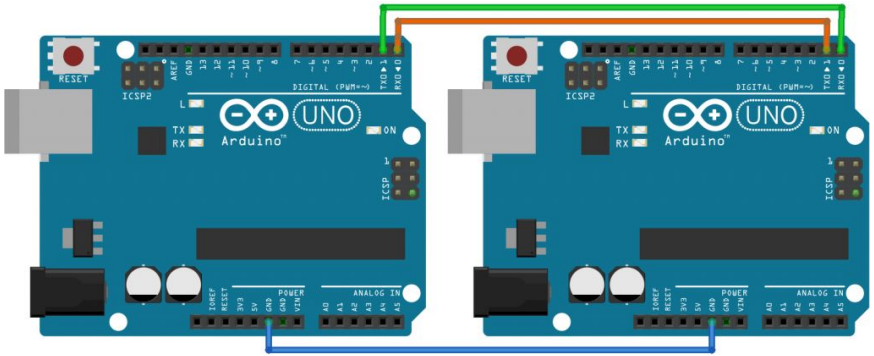


Ultrasonic Sensor Wiring Diagram

03
Communication


Bluetooth


Bluetooth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DIGITAL (PWM~)
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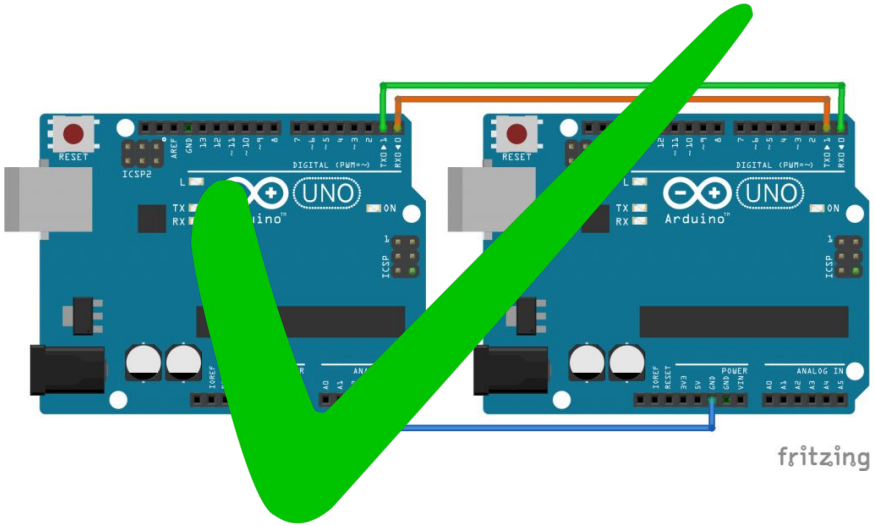
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04
Original Work

Limited Devices

for Deaf-to-Non-Deaf Communication

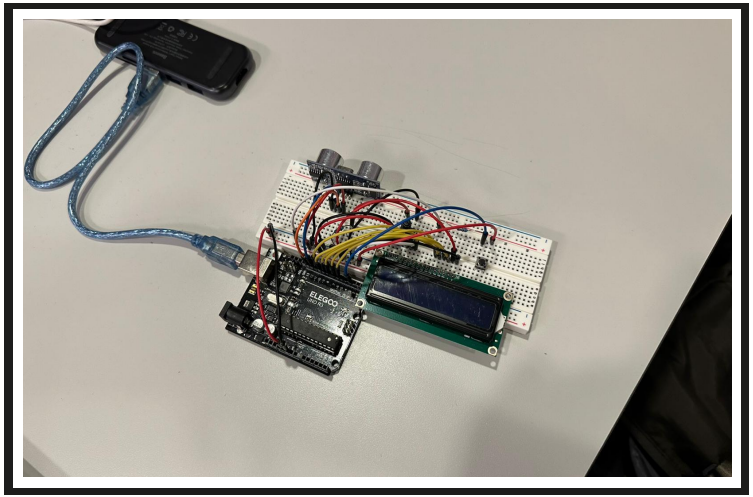
Real-Time

Bidirectional

Conversational Flow

05

What Worked



Distance Measurement Method

The distance measurement method effectively translates hand movements into letters using ultrasonic sensors. By implementing a distance library, the Arduino detects how far the hand is from the sensor and maps specific distances to corresponding letters. This approach enables accurate letter recognition based solely on the distance of the hand from the sensor.

06

What Didn’t Work

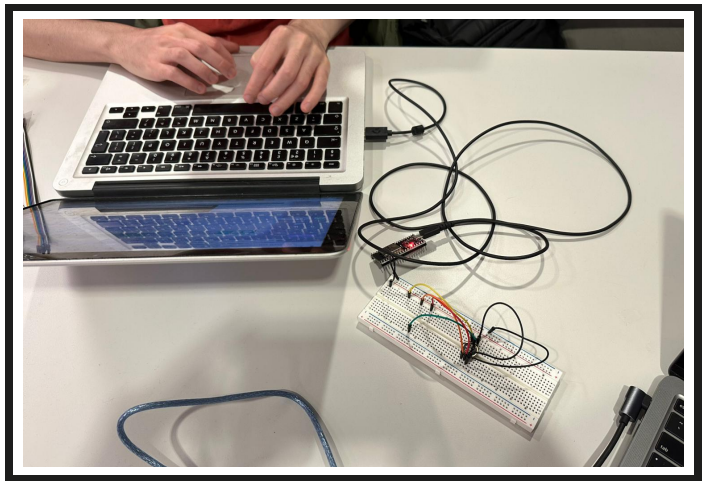
Hand Detection Method

The original design intended to use flex sensors to detect finger bending and determine ASL signs based on hand shape. However, several issues arose:

1. **Limited Sensitivity**
   Flex sensors primarily detected pressure rather than small finger displacements, making it difficult to distinguish minimal finger movements.

2. **Hardware Malfunction**
   Of the six flex sensors purchased, only one functioned partially, but even it failed to provide reliable readings for precise gesture detection.

Speech to Text with Google Cloud API



We are leveraging the Google Cloud API for speech-to-text conversion, integrated with an ESP32 module and an INMP441 MEMS microphone. This setup aims to enable smooth, bidirectional communication:

1. **Conversation Flow**
   For Deaf Users: Signs are translated into text for non-ASL users to read.
   For Non-Deaf Users: Speech is converted into text and displayed for deaf individuals to understand.

2. **Challenges Faced**
   The system has encountered significant challenges, including hardware setup issues and coding complexities. These obstacles have delayed implementation but remain areas of active troubleshooting.

3. **Optimistic Outlook**
   Despite setbacks, we are committed to refining the system to achieve a fully functional bidirectional communication device.

07
Process Highlight

Project Roles

Kyle

- Bluetooth Implementation
- Serial Implementation
- Microphone Input/Speech-To-Text

Nathen

- Flex Sensor Implementation
- Ultrasonic Sensor Implementation

Progress Report

What's done?

- General project idea
- Base ultrasonic sensor code
- Base translation dictionary
- Single Arduino implementation

What needs to be done?

- ESP32 module troubleshooting
- Serial communication implementation
- Duo Arduino implementation
- LCD display code
- Bidirectional communication logic

Thank you!