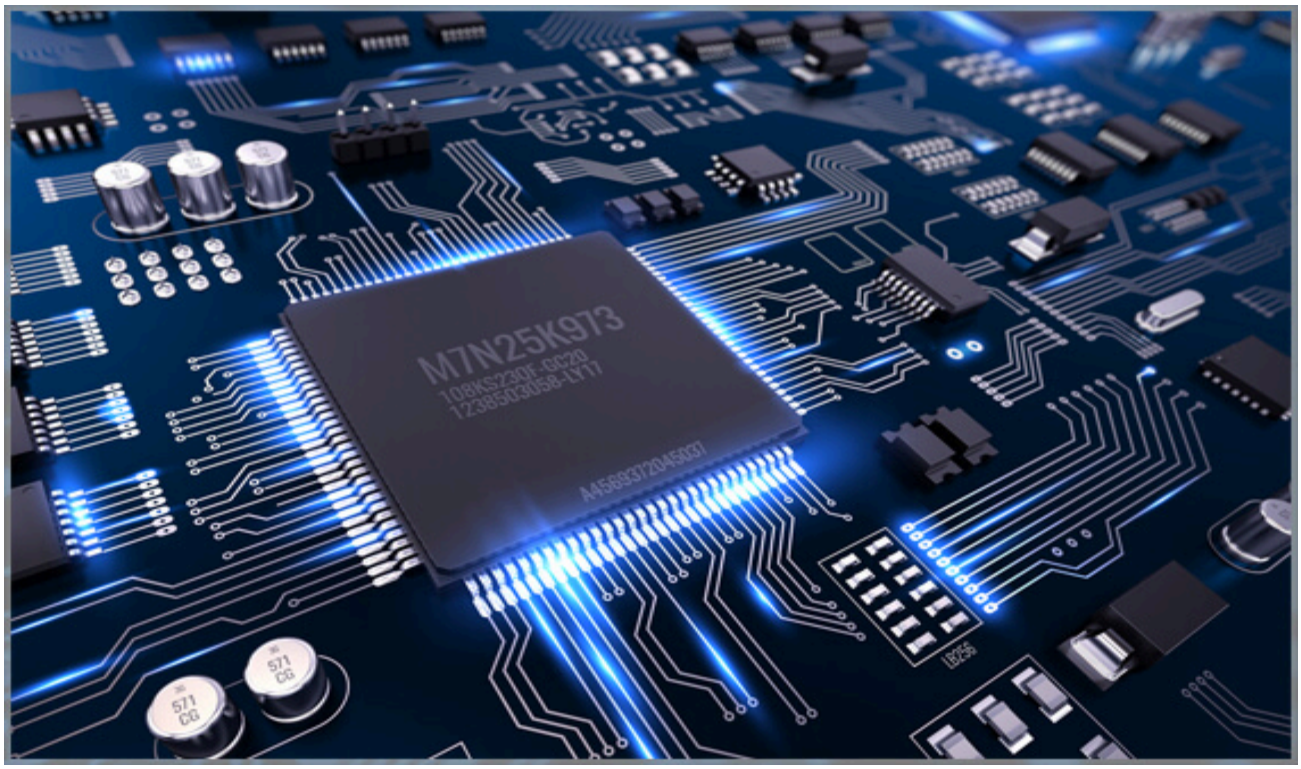

Sign Language Translation System

25.10.2023

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1. Introduction

The Sign Language Translation System is an open-source project designed to help facilitate communication and interaction for the specially-abled community. It converts basic hand symbols representing the 26 English alphabets according to **our custom Sign Language script** and displays them on a device screen. This documentation provides an overview of the project, its components, and how to set it up.

2. Project Details

The project was inspired by the idea of helping specially-abled(dumb,deaf,blind) people to **easily communicate with other people using hand fingers**. While this concept shares similarities with the sign language translation system, its implementation differs in the sense that **we use our fingers to generate the sensor signals for the alphabets instead of using complete hand and wrist movement**.

Milestones

Idea & Team:

- Brainstorm project concept.
- Pick hardware and software.

Build & Test:

- Creating a working prototype.
- Making a medium to display the output.
- Test, tweak, and fix.

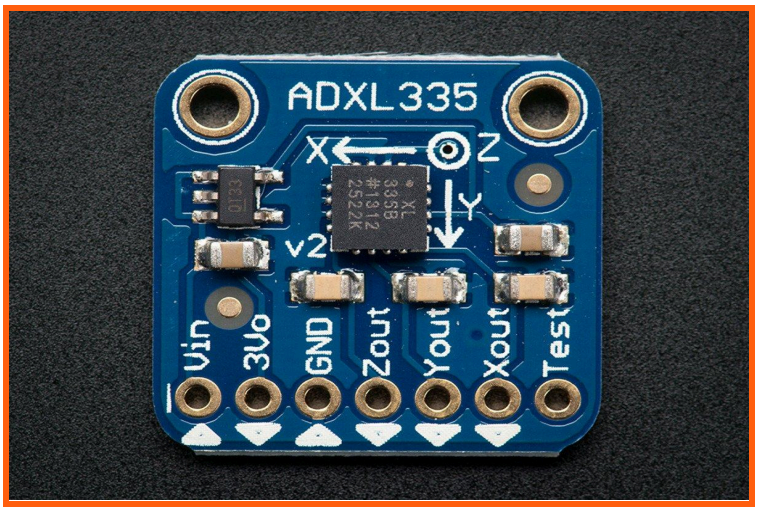
Show & Present:

- Present the project.
- Open-source it for others to explore.

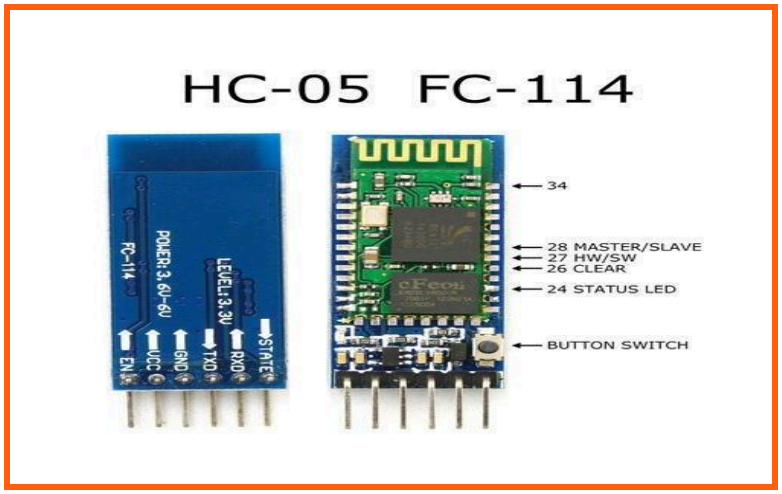
2.2 Hardware Components

Key Components

Accelerometer : Accelerometer is used to measure the tilt in the palm.

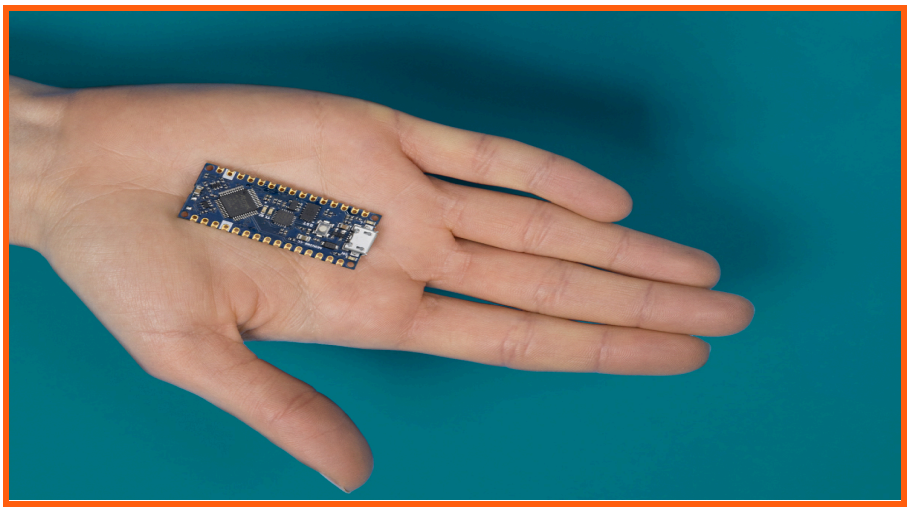


Bluetooth Module : To transmit the output obtained to a suitable medium



Flex Sensors : **Five sensors placed on a glove: four for the fingers and one for the thumb, measuring the bend in these appendages.**

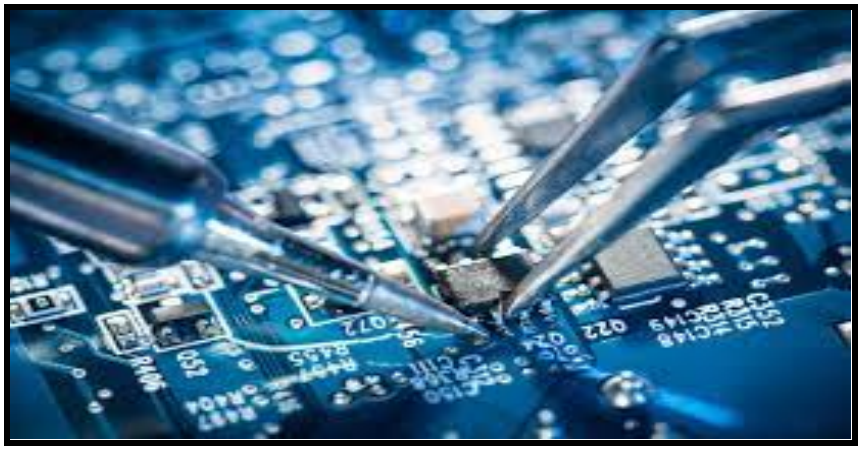
Arduino Nano Microcontroller : **The smaller and compact microcontroller. We want it to fit in the palm of your hand... literally!**



2.3 System Working

- The accelerometer measures the tilt of the user's palm.
- Flex sensors on the glove detect finger, thumb, and palm bend angles.
- The Arduino Nano interprets the sensor data and recognizes sign language symbols.
- The recognized symbol data is transferred to the output via Bluetooth.
- We display the symbol visually and provide voice output.

3. Circuit Assembly



The hardware components are assembled as described above, and a robust software system is developed to handle the **recognition and translation of sign language symbols**.

1) **Sensors:**
   - Flex Sensors: These are attached to each finger and measure the **degree of flexion** in each finger joint to detect sign language gestures.
   - Accelerometer: Provides **orientation and motion data**, which can help distinguish signs and gestures.

2) **Microcontroller:**
   - Arduino Nano used as the main controller to process data from the sensors, accelerometer.
   - It interprets the sign language gestures, converts them into text, and sends data for the speech synthesis.

3) **Communication Module:**
   - Bluetooth(HC-05 module) or other wireless communication technology can be used to send and receive data between the glove and external devices.

4) **External Device Integration:**
   - Software on external devices (smartphone/PC) can receive and display the translated text or synthesized speech.

4. Medium for output

We are planning to create an app/website to work in conjunction with the sign language translation system. The app/website visually represents the symbols generated by the system and provides voice output for an intuitive communication experience. App/website will also be used for testing.

5. Future Scope

The Sign Language Translation System has promising future applications, including:

- **Integration with Various Services**: The system can be further integrated with various services, potentially creating employment opportunities for individuals with hearing and speech impairments.

- **Expanded Language Support:** Expanding the range of supported sign languages is essential, as different regions have their own unique sign languages. Supporting more languages can make the technology more inclusive.

- **Home Automation:** The system can be enhanced with control capabilities for home automation, enabling users to control various household appliances using sign language.

- **Health Monitoring:** The system can be paired with fitness sensors to monitor the health and well-being of individuals, contributing to their overall quality of life.

- **Feedback and User Testing:** Continuously gather feedback from users and conduct user testing to refine the glove's performance and features.

6. References

- https://www.hackster.io
- https://circuitdigest.com/microcontroller-projects/interfacing-flex-sensor-with-arduino
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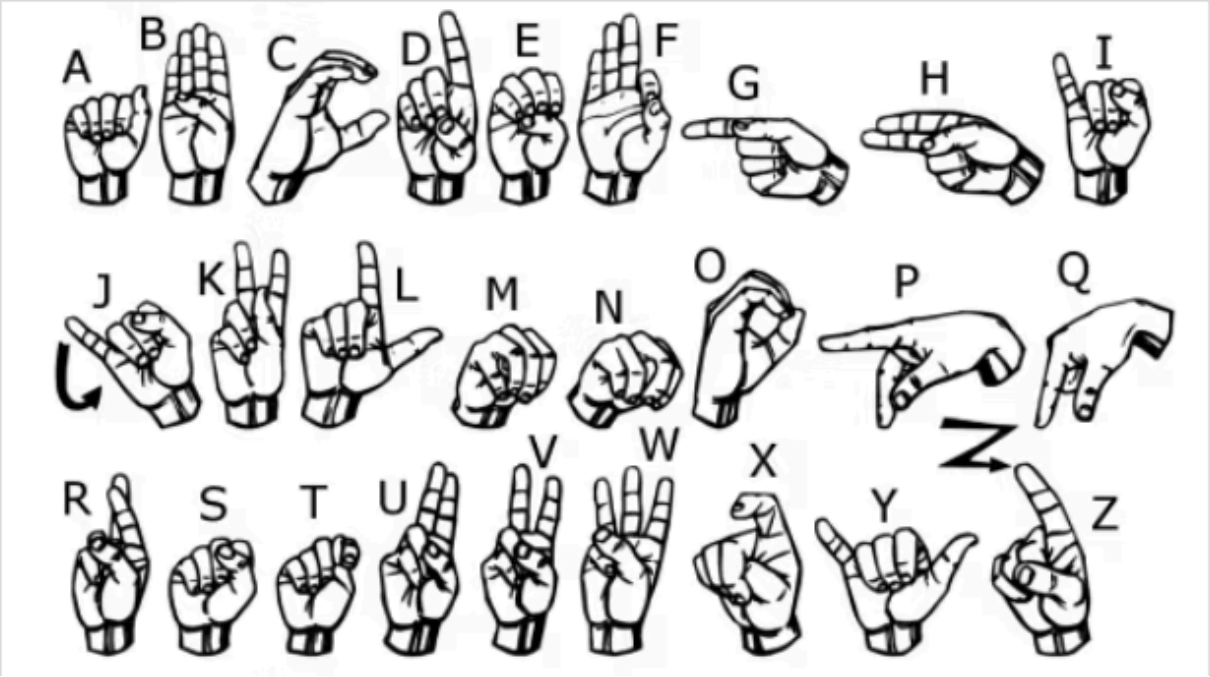
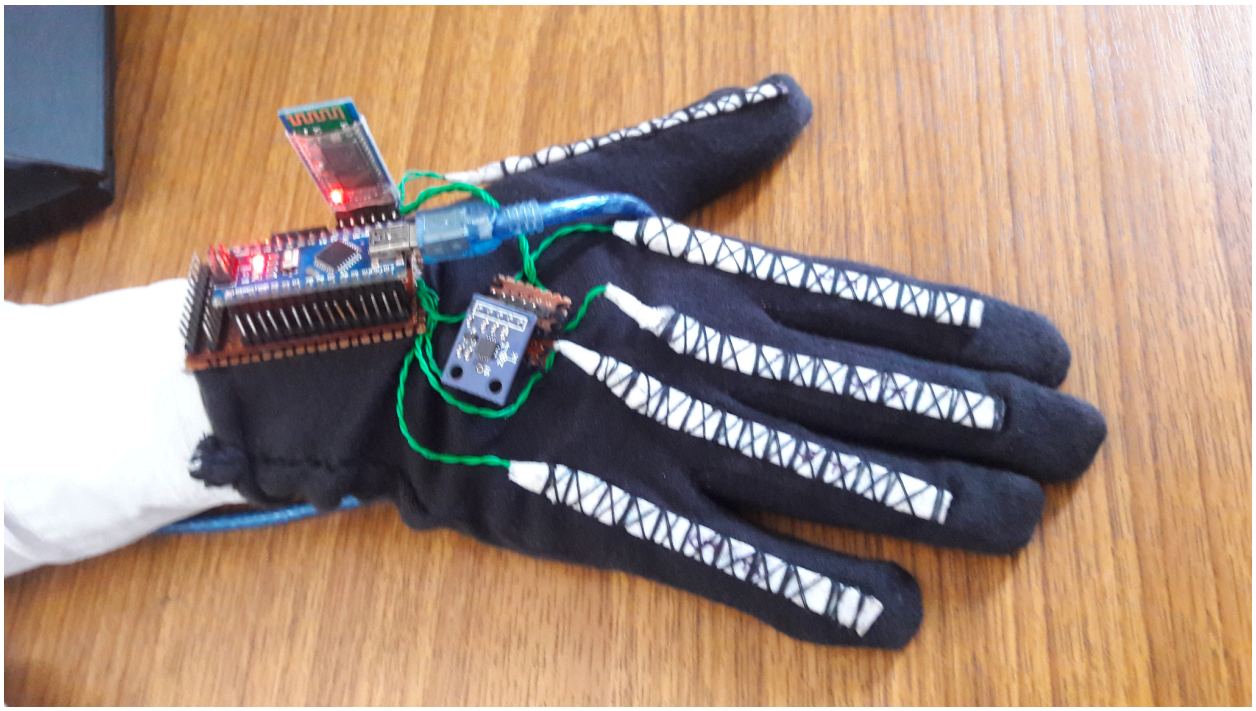
EXPECTED PROJECT PREVIEW :