

Sign Language Detection System

Project Pitch for SIT210

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Understanding the Problem Domain

Communication Barriers

Significant challenges for individuals with speech and hearing impairments in daily interactions.

Industry Solutions

Existing interpreter services are often **expensive**, and current real-time technologies are **limited**.

Key Challenges

- Accessibility & Cost
- Lack of Multi-Modal Aids
- Limited Context-Specific Solutions

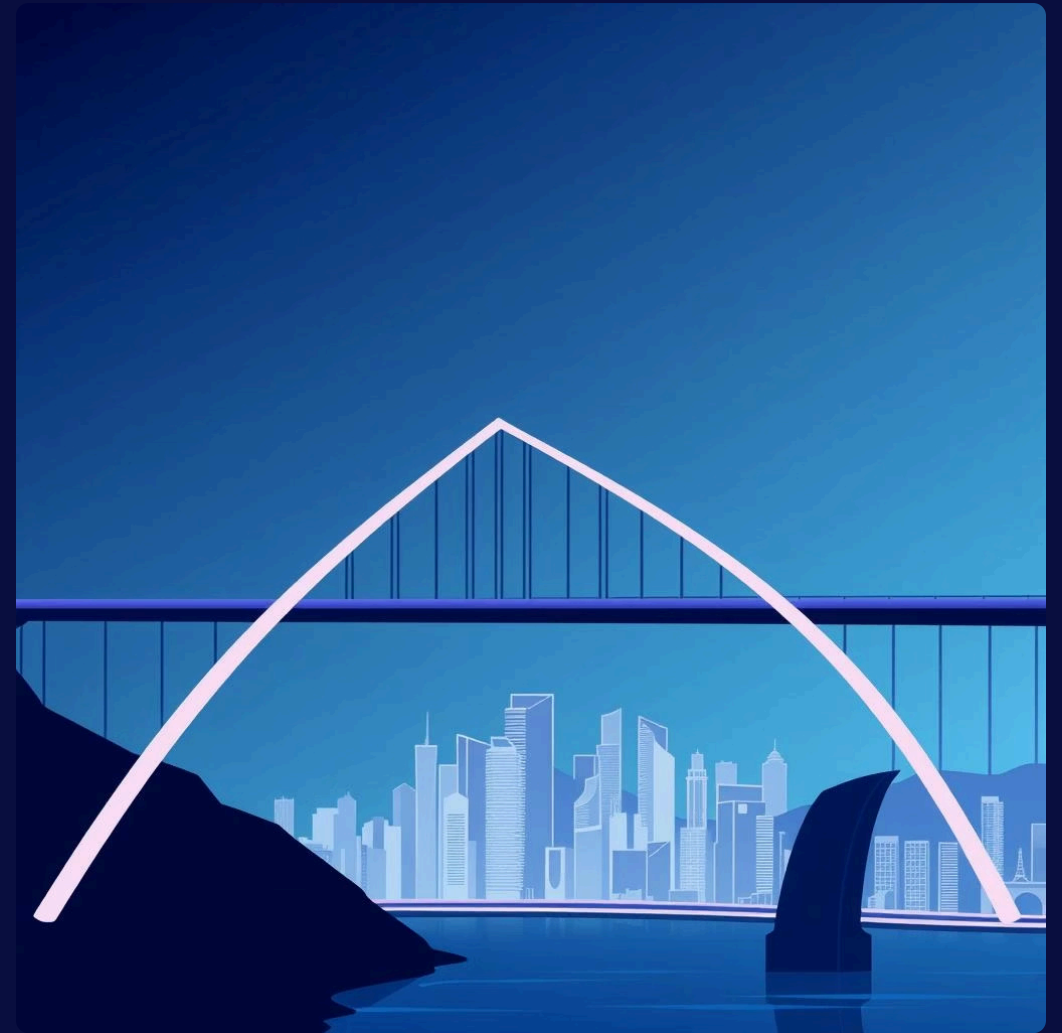
Bridging Gaps & Seizing Opportunities



Current Limitations

Existing solutions often fall short in terms of **flexibility** and **affordability**, creating significant hurdles for widespread adoption.

- High cost of specialized equipment
- Lack of adaptability to diverse environments
- Dependency on human interpreters



Emerging Opportunities

There's a clear opportunity to leverage **embedded systems** to develop multi-model, low-cost assistive devices.

- Direct sign-to-text/speech translation
- Enhanced independence for users
- Scalable and accessible technology

1

Identify the Need

Recognizing the communication void.

2

Innovate Solutions

Developing accessible technology.

3

Empower Users

Fostering independence.

Our Innovative Solution Overview



Push-Button Aid

Utilizing an **Arduino Nano 33 IoT** for direct, tactile input.



Camera-Based Recognition

Leveraging a **Raspberry Pi 4** for advanced visual sign detection.



Real-time Translation

Instantaneous conversion of signs to text/speech.



Multi-Modal Input

Combining tactile and visual methods for comprehensive input.



Accessible UI

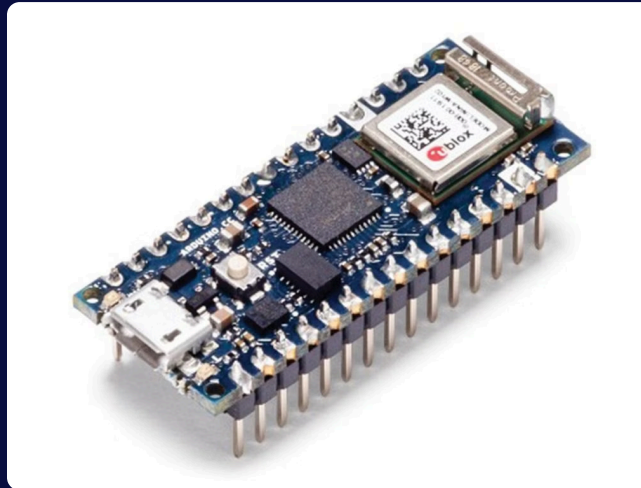
Designing for ease of use and broad accessibility.

Core System Components



Raspberry Pi 4

- **Gesture Recognition:** Processing video input.
- **Dashboard/Display:** Visual output interface.
- **Audio Output:** Text-to-speech functionality.



Arduino Nano 33 IoT

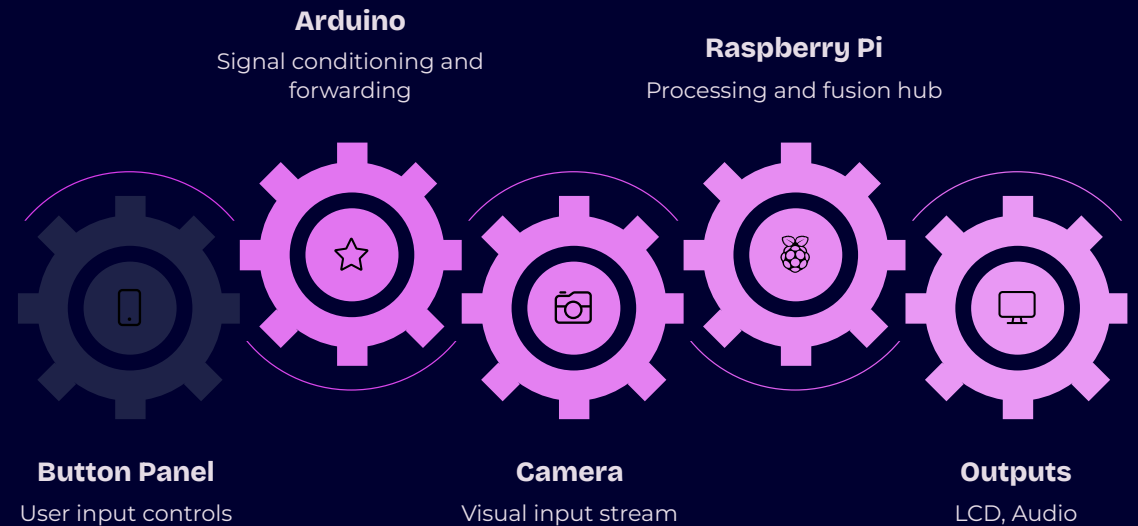
- **Button Panel Input:** Direct user interaction.
- **LCD Feedback:** Immediate visual confirmation.
- **Protocol Communication:** Interfacing with Pi.



Camera & Interconnections

- **Real-time Video Feed:** Capturing sign language.
- **Wired:** UART/I2C/SPI for robust data flow.

System Architecture: Block Diagram



This diagram illustrates the logical flow and interconnection of the main components within our sign language detection system.



Robust Communication Protocols



UART

Universal Asynchronous Receiver-Transmitter for serial data exchange.



I2C

Inter-Integrated Circuit for efficient short-distance communication.



SPI

Serial Peripheral Interface for high-speed synchronous data transfer.

These protocols ensure **reliable and efficient data exchange** between the Arduino and Raspberry Pi, forming the backbone of our system's communication.

Key Evaluation Criteria

Robustness

Ability to handle **simultaneous inputs** and ensure effective **error recovery**.

Responsiveness

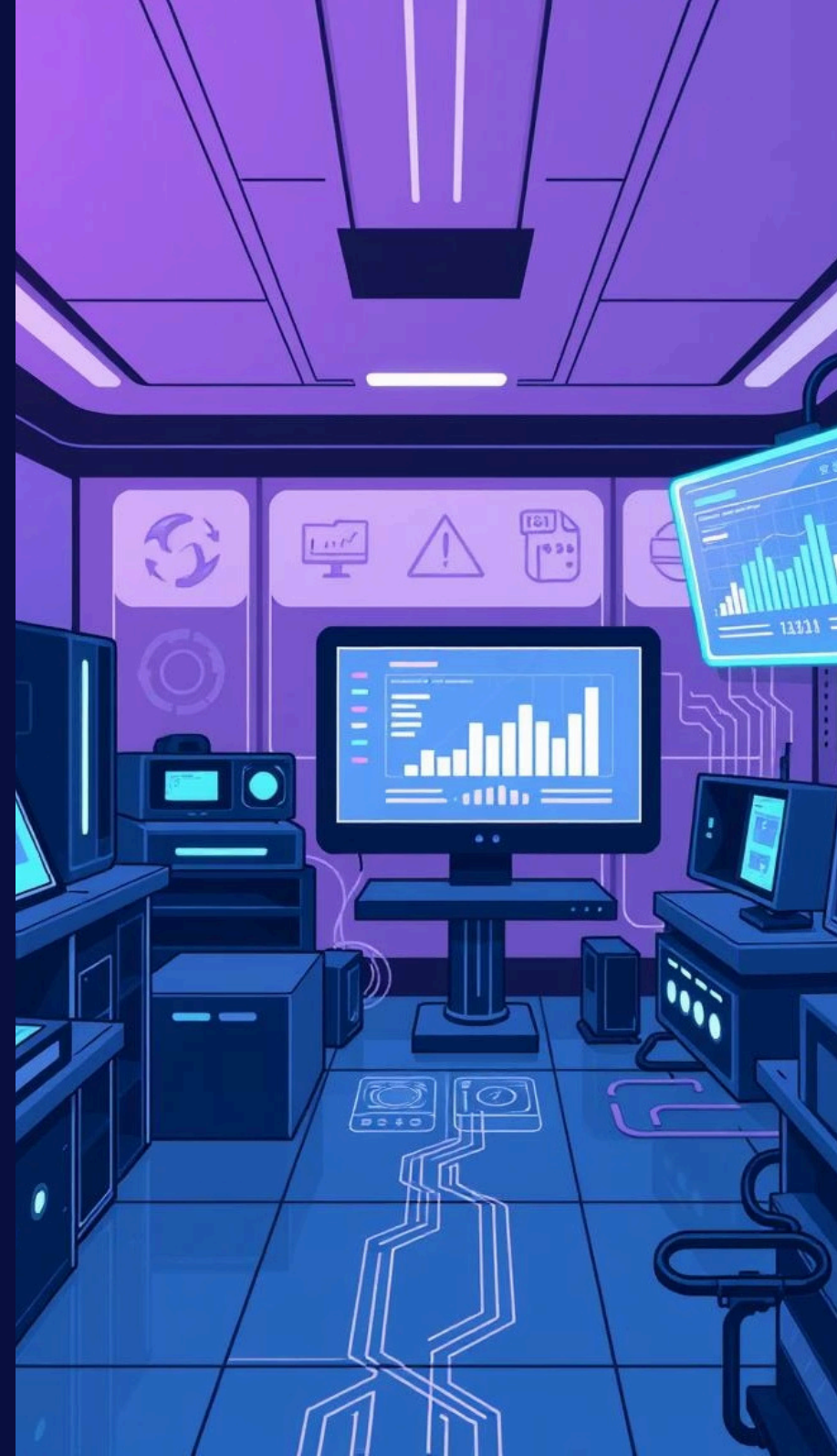
Providing **real-time feedback** for all user actions and system processes.

Fault Tolerance

System maintains functionality even if one input method experiences a failure.

Tested Prototype

Demonstrated performance across **multiple user and environmental scenarios**.



Project Scope & Justification

Integrated Systems

Two embedded systems seamlessly integrated for a justified, real-world purpose.



Protocol Demonstration

Clear demonstration of communication protocols (I2C/SPI/UART) in action.

Empowering Communication

