



# Arabic sign language communication device

## Team 2

### Problem statement

Deaf individuals often encounter significant challenges primarily related to communication when interacting with the hearing world.

### Target Specifications

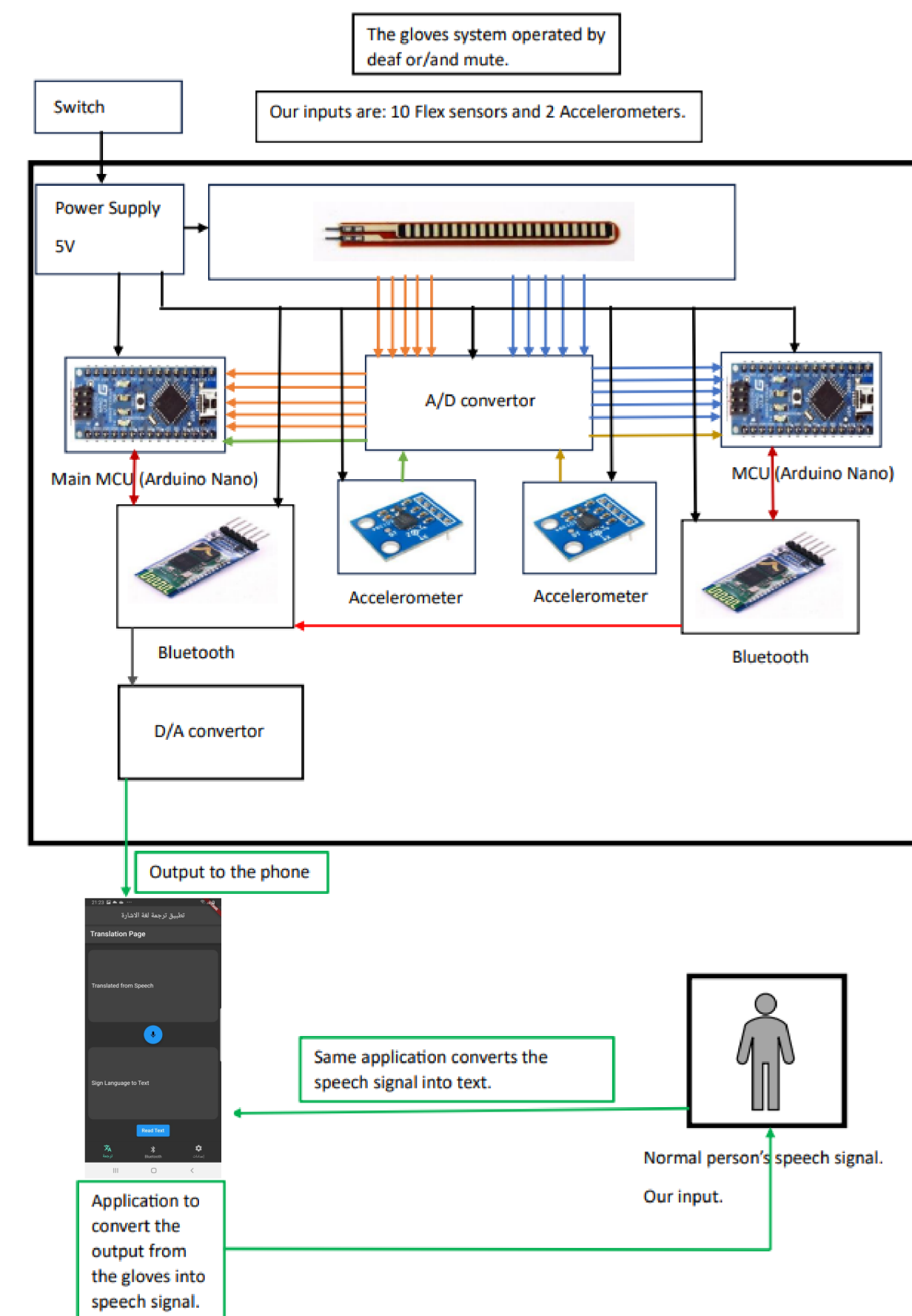
- **Translation accuracy:** The solution shall have a translation accuracy on average of 80%.
- **Real-Time Translation:** The system shall translate each sign in less than a second.
- **Recorded vocabulary/verses:** The device shall be able to translate at least 10 signs to words/verses.
- **Battery Efficiency:** Power-efficient components shall be utilized to optimize battery life, allowing the usage to minimum 45 hours.

### Constraints

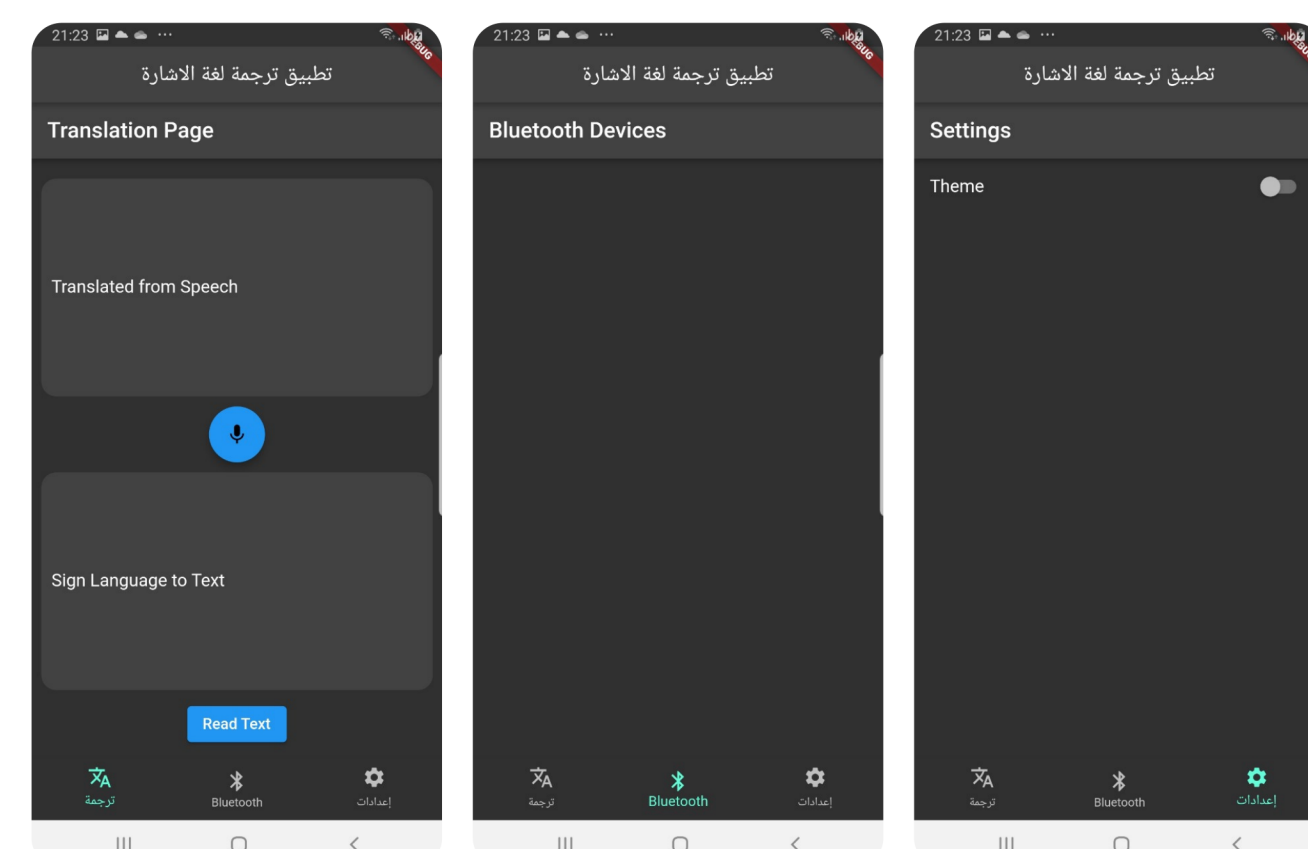
- **Real-Time Translation:** The project aims for less than 1-second delay in translating words or phrases, addressing challenges like network latency, processing, and queueing delays.
- **Translation Accuracy:** The goal is to achieve at least 80% accuracy in recognizing and translating sign language gestures into spoken words, targeting a minimum of 10 sign language words/phrases.
- **Time-Intensive Task:** With only 10 weeks available, completing the project with high quality and all planned features is a significant challenge.

### Prototype Design

#### Flow chart



#### Application



#### Prototype Overview:

- The prototype is an innovative Arabic bidirectional sign language translator communication device.
- It translates sign language into voice and text, offering a seamless and versatile user experience.
- Advanced sensors capture intricate hand movements for precise sign language interpretation.

#### Flow Chart:

- A functional diagram was drawn to illustrate the prototype's operation.
- This flow chart is crucial for understanding how the prototype functions and for communicating its design to interested parties.

#### Application:

The developed application has dual functionalities:

- It processes sign language performed by a deaf/mute individual and vocalizes the translated text in Arabic.
- The application also features a voice detector to convert spoken words into text, enabling the deaf/mute person to read it. This bidirectional functionality enhances communication.

#### Physical Prototype:

- The physical prototype, as shown, includes flex sensors on each finger and accelerometers to capture hand motion and angles.
- A microcontroller and Bluetooth module are integrated for processing and transmitting data.
- This setup ensures accurate detection of sign language gestures and seamless translation into Arabic, making it a sophisticated and effective communication device.

#### Physical prototype



Check out how our product work by scanning this QR code :)



### Proof that specifications were met

- **Real-Time Translation and Number of Signs:** The project successfully achieved its goal of translating 10 signs of words or verses. The communication delay was maintained at approximately 100ms, and the overall translation time was effectively kept under 1 second, meeting the project's real-time translation objectives.
- **Translation Accuracy:** The project reached a successful conclusion with the prototype demonstrating high translation accuracy. This was made possible by the effective use of flex sensors, which provided reliable and precise recognition of sign language gestures.
- **Battery Efficiency:** The glove model's total power consumption is less than 60 mAh, with the major components contributing to this figure. The prototype's two batteries have a total capacity of 3800 mAh, enabling an operation time of about 63.33 hours before needing a recharge, surpassing the target of 45 hours.

### Conclusion

The project successfully developed a cutting-edge device translating Arabic sign language into spoken words, enhancing communication for the deaf and mute community through advanced sensor technology and innovative software applications.

### Team members

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