Gesture Guide

Final Presentation

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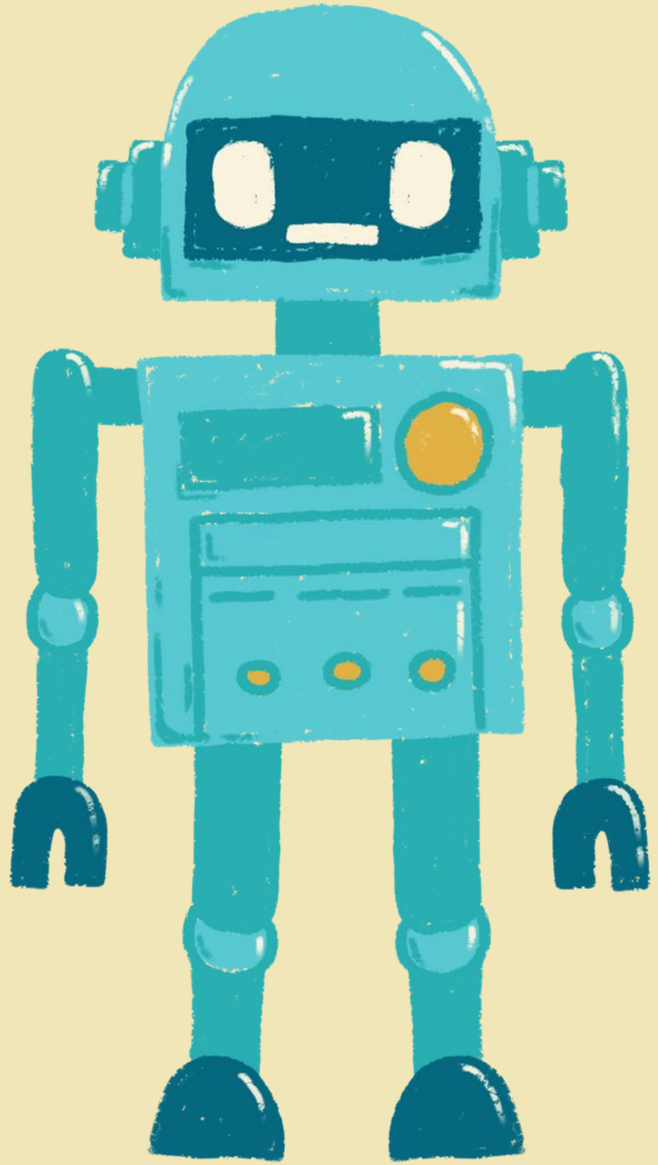

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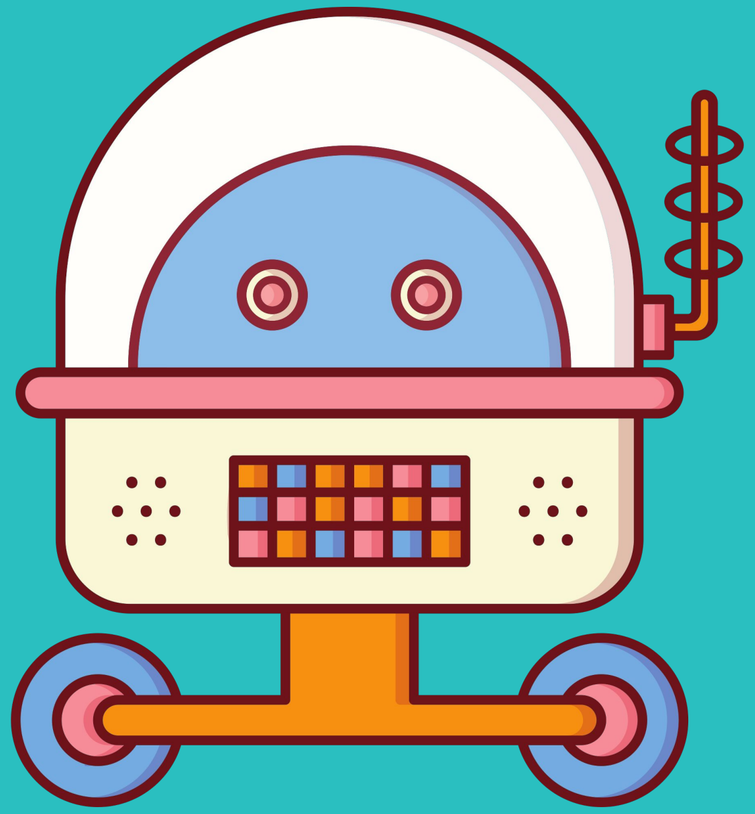

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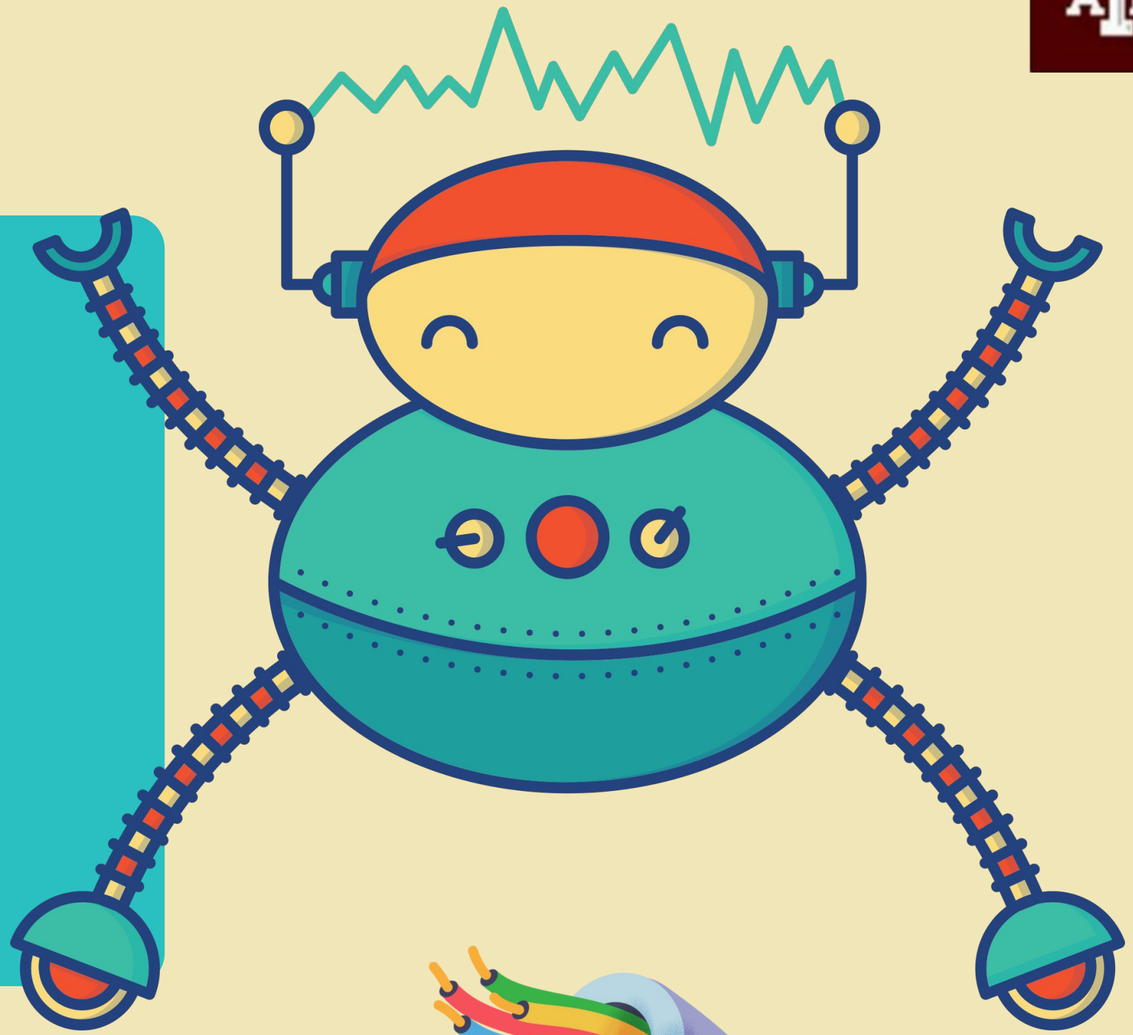


Introduction

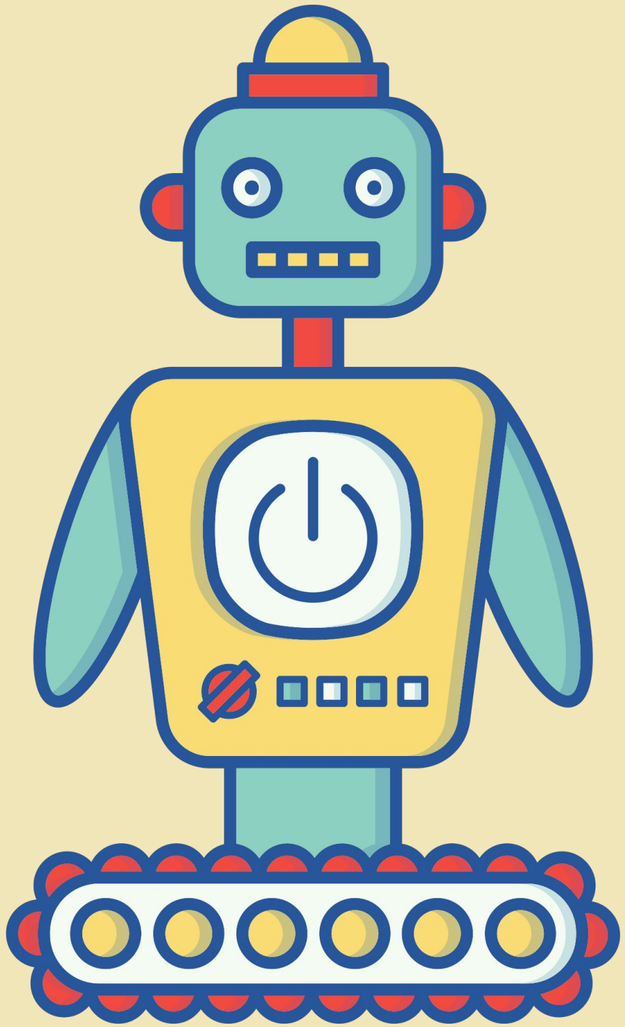
- Physical impairments may make it more difficult for a person to interact with others and their environment.

- Technological developments have created new opportunities for people with physical disabilities to enhance their lives.

- Guide gesture control is one of the technologies that enables a person with a disability to use finger movements to interact with devices

- The use of hand gesture control could enable people with physical disabilities to carry out tasks that might not be possible.

2. Problem Statement



Problem Statement

- Individuals with physical disabilities face significant challenges in maintaining independence within their homes.
- Current assistive technologies are costly and have limitations.
- There is a need for a cost-effective and nonintrusive solution to enhance the quality of life for patients with spinal cord injuries (SCI).

3. Proposed Solution

Proposed Solution

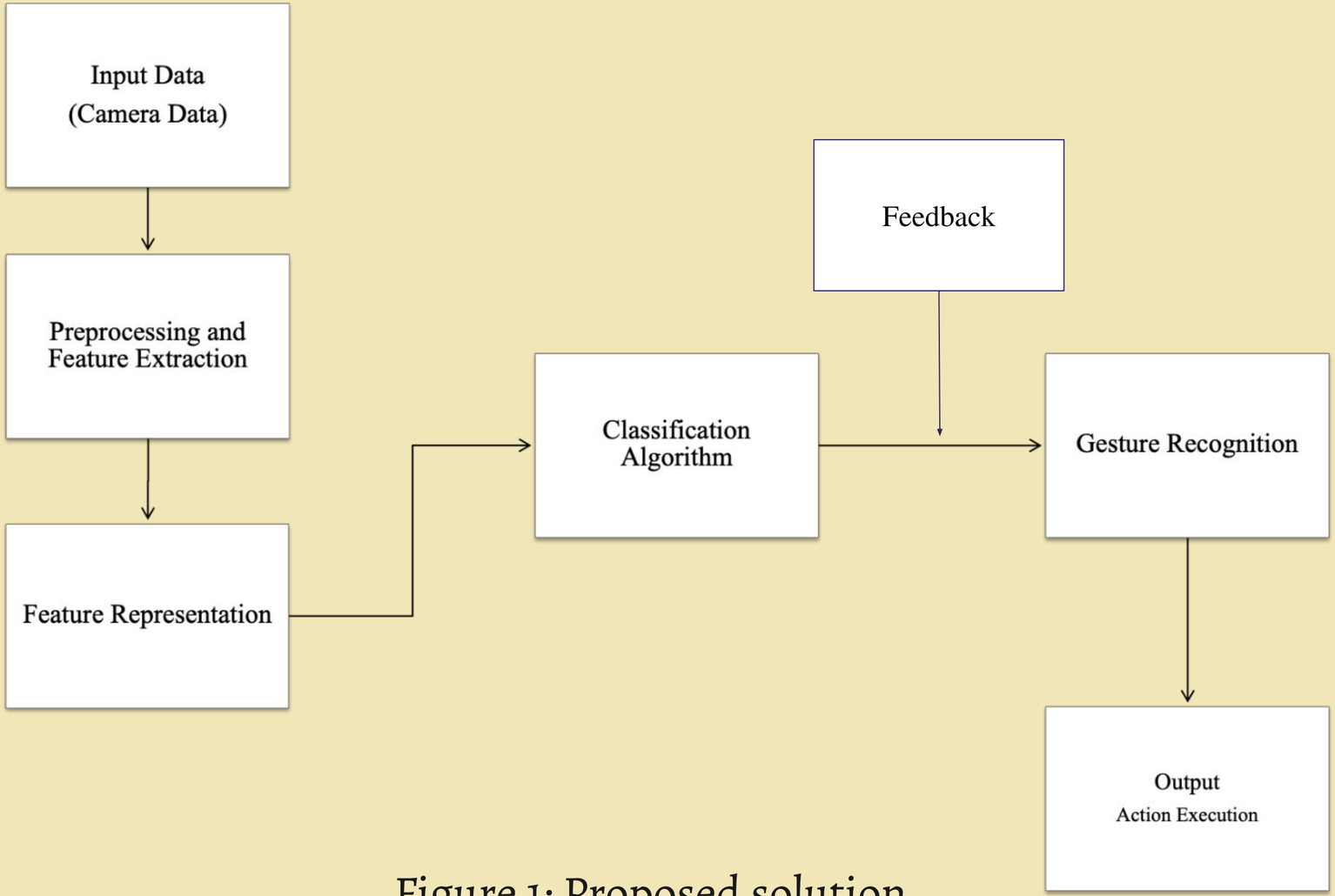


Figure 1: Proposed solution

4. Block Diagram

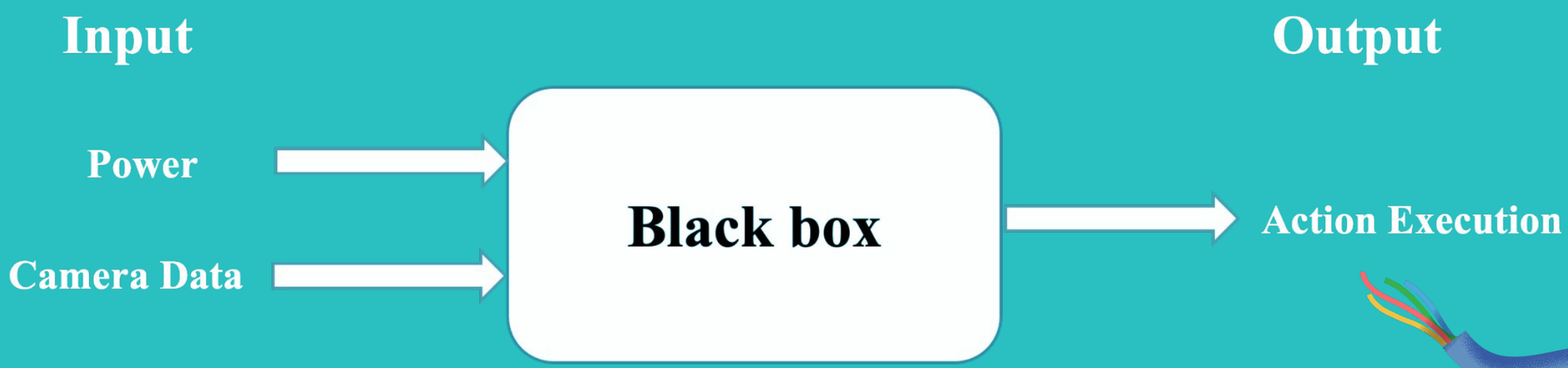


Figure 2: Block diagram

Functional Modeling

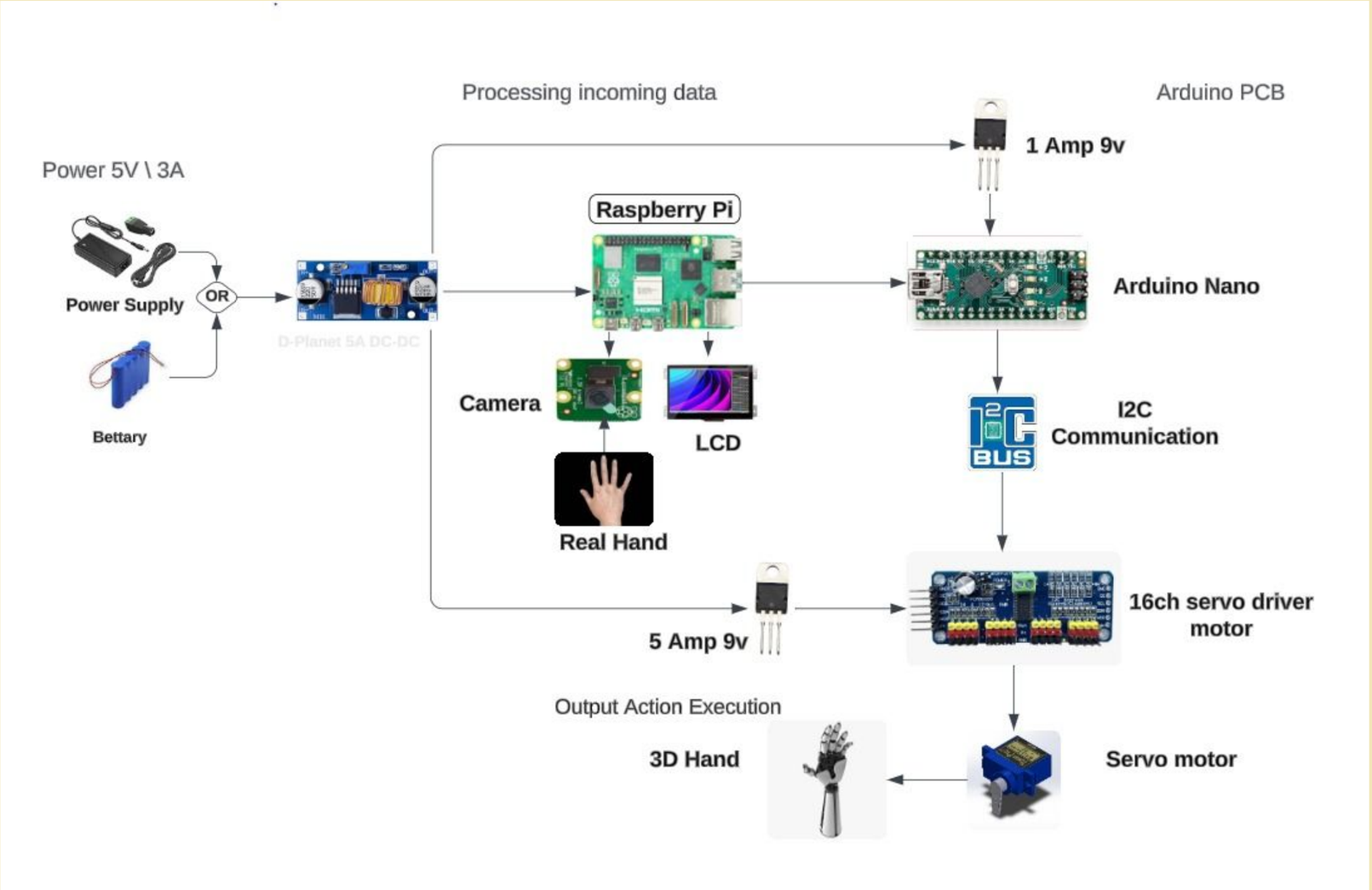
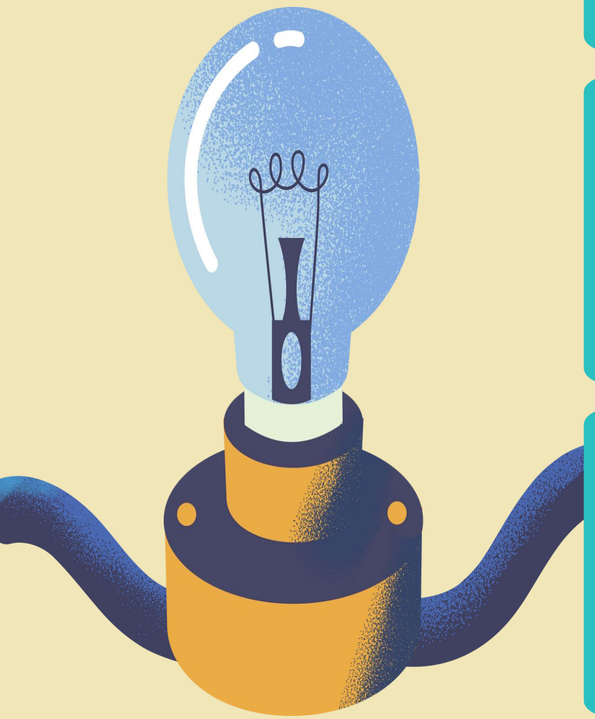


Figure 3 : Functional Modeling

5. Relevant Standards and Constraints

Training

- The design constraints include the training time needed to learn Python programming language.
- ECEN 210 , 449 and ENGR 102



Realistic application

- Additionally, there is a lack of real-life applications of machine learning for programming and identifying hands in cameras.

Benefits

- The project could bring significant benefits and progress in medicine and physical therapy.

6. Existing Solutions

1

Multivariate fuzzy decision tree (MFDT):

The proposal suggests using MFDT for learning and classifying hand gestures. This method uses fewer nodes than the fuzzy decision tree method, which uses a multivariate approach.

2

Hidden Markov Model (HMM):

HMM is widely used for time-series analysis, segmentation, and classification. It is popular for dynamic hand gesture recognition because it can display different states and state transitions .[4]

3

3D Skeleton-Based Hand Gesture (3D-BHG):

3D skeleton sequences are popular for action and gesture recognition because they are robust and easier to train. CNN and LSTM model hand gestures, while Graph Convolutional Networks, STST, and DSTA-Net are used for action recognition.

4

Continual Gesture Activity (CGA):

The proposal suggests a lifelong adaptive learning framework for human-robot interaction using motion sensor data and memory enhancement for learning static, single-image gestures incrementally.

7. Performance Criteria

		Criteria			
		Environmental	**Economical**	**Performance**	**Attainability**
Existing Solutions	**Our Project**	Fewer procedural operations after training and testing, Lower power consumption and excellent user assistant.	Easy to use, technically inexpensive and content based project.	High Performance more than MFDT and HMM	High
	MFDT	Low impact	Moderate Considerations	Moderate performance	High
	HMM	Fewer uses than MFDT, lower power.	It needs training from the user first and then dealing with it	Similar performance of MFDT	Moderate
	3D-BHG	Low impact	High Considerations	High performance	Moderate
	CGA	Low impact	High Considerations	High performance	Moderate

Table 1 : Performance Criteria

8. Timeline

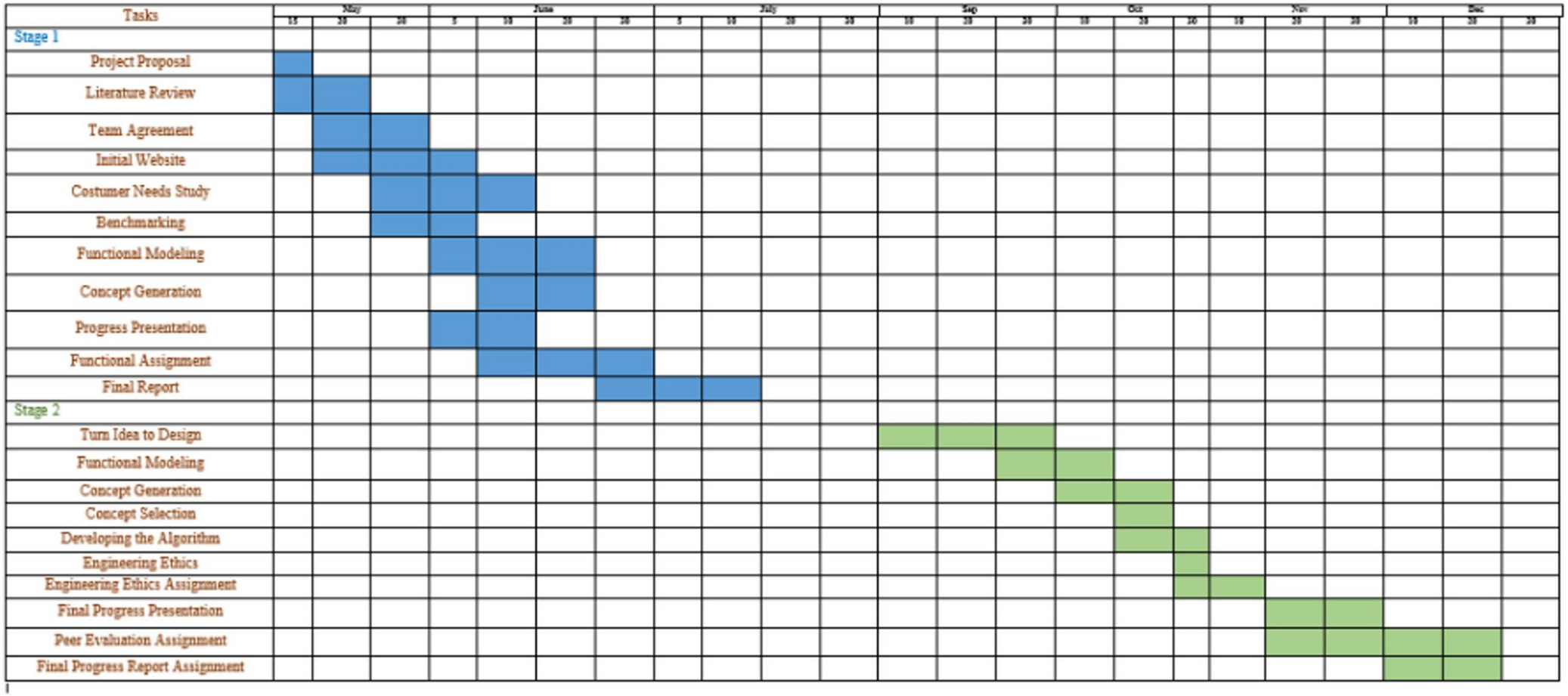


Table 2 : Timeline of Stage 1 and Stage 2

9. Plans of the next semester

Turn idea to Design:

Building a hand gesture recognition sensor is a challenging yet rewarding project, interpreting human hand gestures to control machines or digital interfaces, becoming increasingly important in the digital world.

Step 1: Understanding the Principle

Hand gesture recognition uses ultrasonic sensors to detect sound waves that bounce back to an object, determining its distance from the sensor. Over time, this distance is tracked to recognize specific hand gestures.

Step 2: Setting Up the Sensors

Connect ultrasonic sensors' VCC, GND, TRIG, and ECHO pins to Arduino's digital pins, sending sound waves and listening for return signals.

Step 3: Programming the Arduino

A program should initiate ultrasonic sensors, send a 10-microsecond pulse to each sensor's TRIG pin, listen for the return signal at the ECHO pin, and calculate hand distance.

Step 4: Interpreting Hand Gestures

Definement of gestures in hand gesture recognition sensors is challenging, varying based on application. Examples include "swipe in" and "swipe out" gestures.

Step 5: Providing Feedback

Finally, ensure the user receives feedback confirming their gesture recognition, which can be as simple as lighting an LED or as complex as sending a command.

10. Conclusion

Empowerment through Independence

- The proposed system aims to empower individuals with physical disabilities.
- Enables independent control of their environment through accurate hand gestures recognition.

Enhanced Quality of Life

- Assists individuals with disabilities in efficiently accessing and controlling functions.
- Enhances quality of life with minimal effort.

Seamless User Experience

- Framework designed to precisely identify various finger combinations as hand gestures
- Provides a seamless user experience for individuals with disabilities.

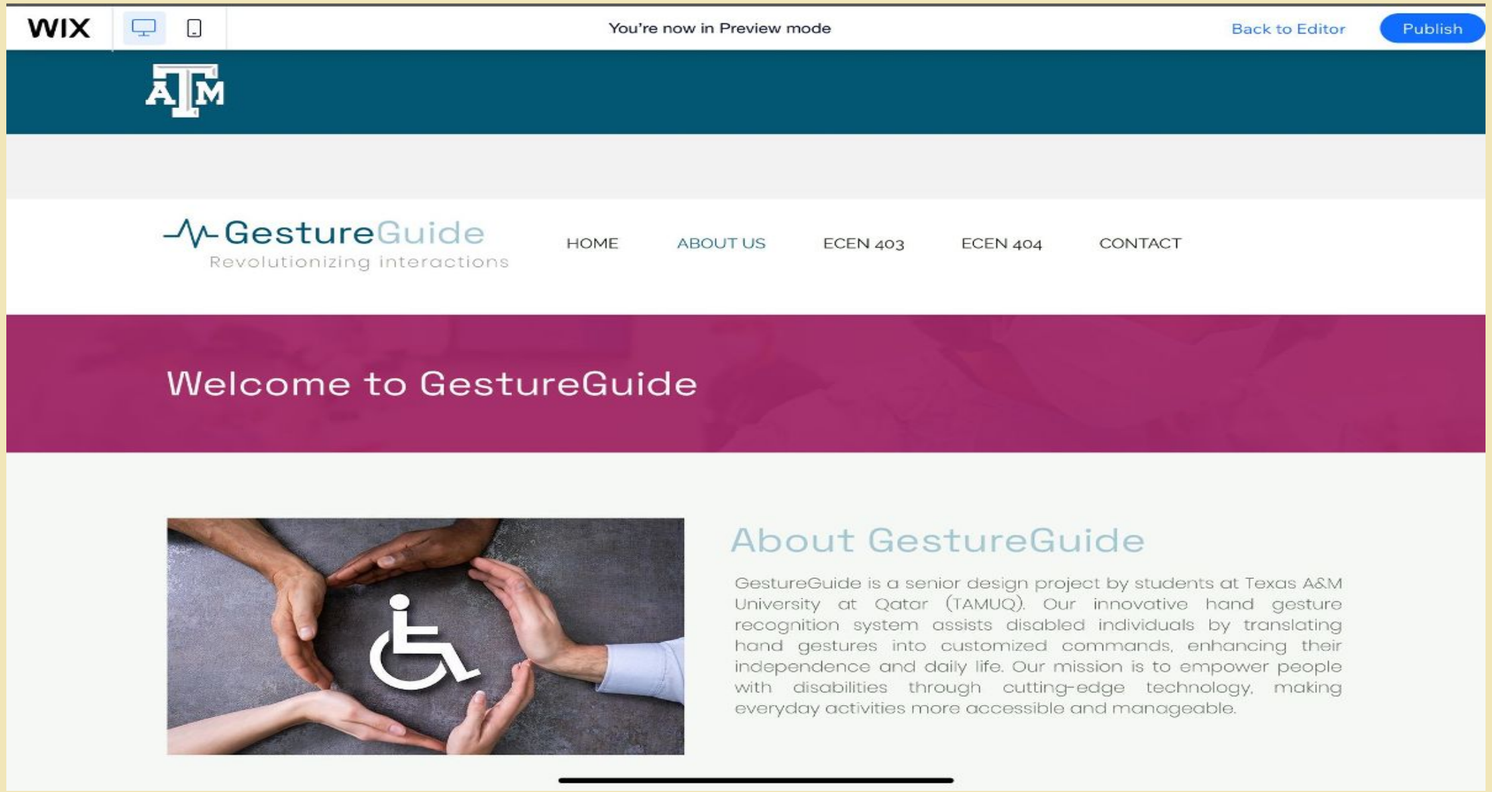
High Accuracy and Speed

- Utilizes computer vision methods or processing chips.
- Identifies different finger gestures with an accuracy rate of approximately 95%.
- Access time of up to 300 ms

Interaction with Electronic Devices

- Allows individuals with physical disabilities to interact with electronic devices.
- Enables performance of tasks that might otherwise be challenging.

11. Website



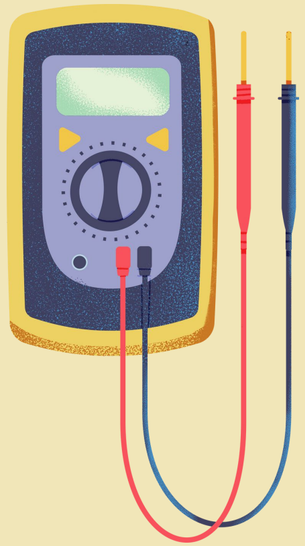


Figure 4 : Website

https://gestureguides.com

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Thank you !

Any Questions?