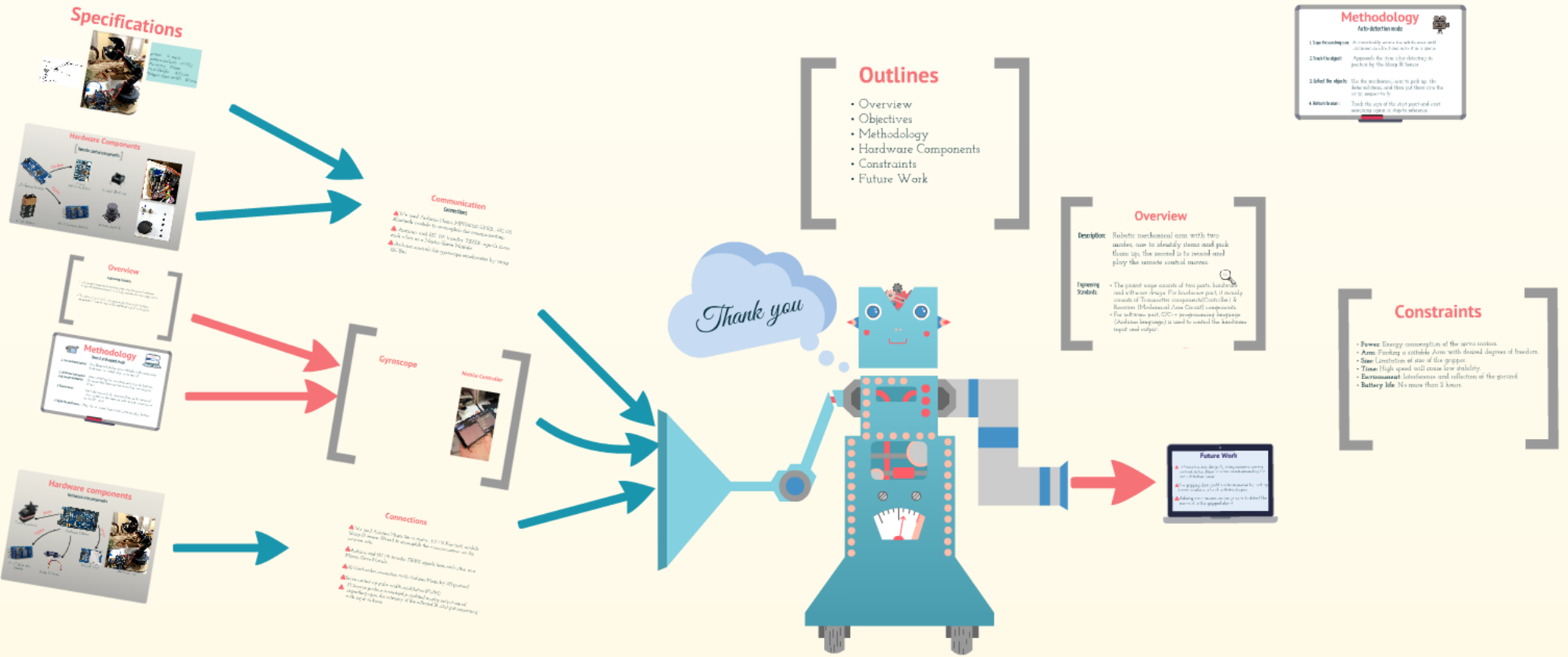


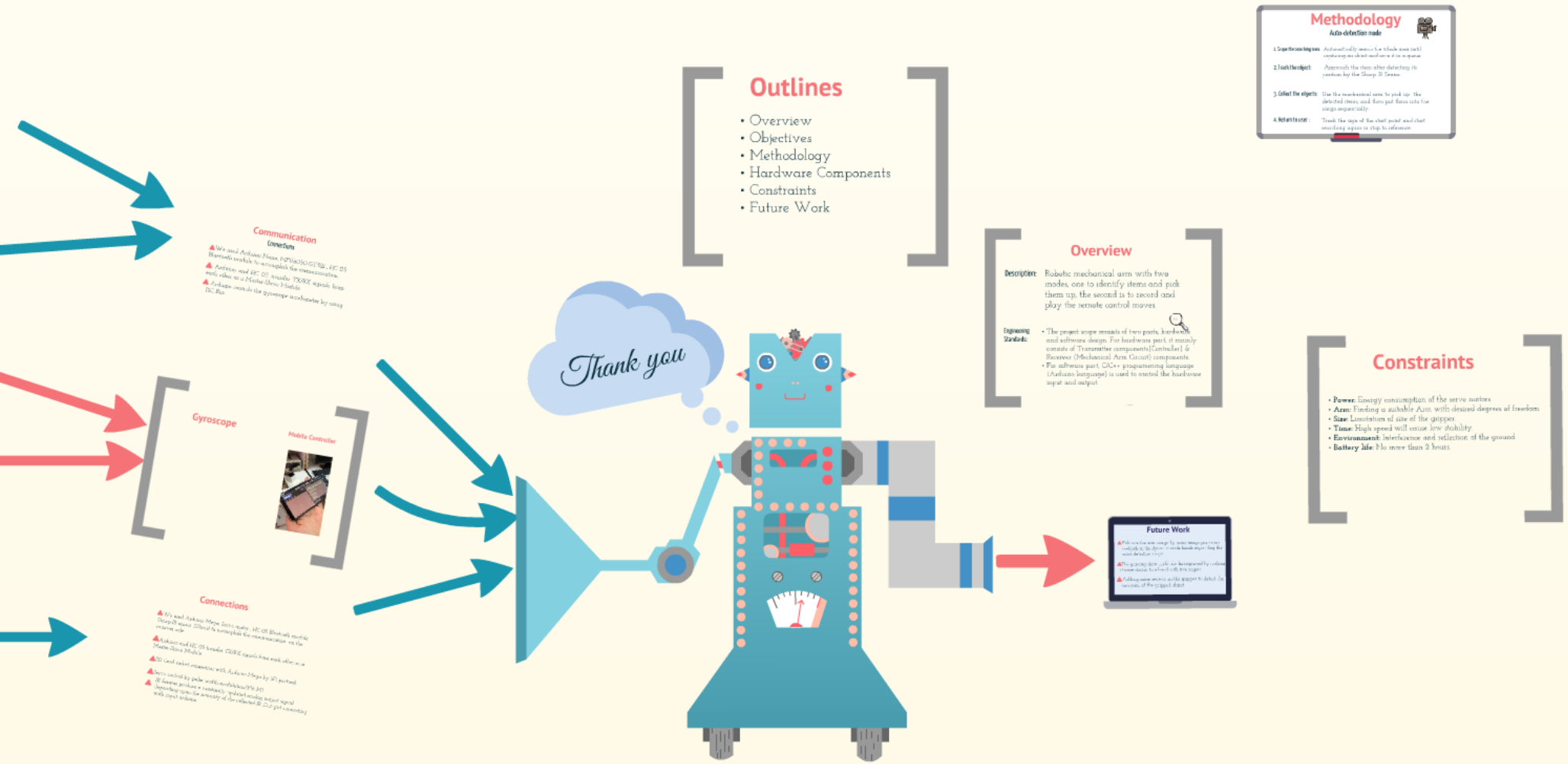
Record & Repeat robotic Arm

Zaina Al-Saed & Nada Mahamdah

Mrs. Amsa' Afifi

Graduation Project II

ANNU- Winter 2018



Record & Repeat robotic Arm

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Record & Repeat robotic Arm

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Graduation Project II

ANNU- Winter 2018

Outlines

- Overview
- Objectives
- Methodology
- Hardware Components
- Constraints
- Future Work

Overview

Description: Robotic mechanical arm with two modes, one to identify items and pick them up, the second is to record and play the remote control moves.

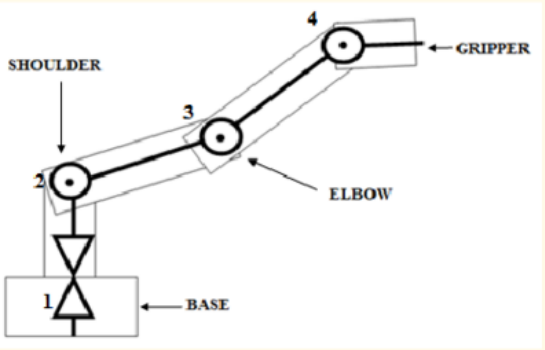
Engineering Standards:

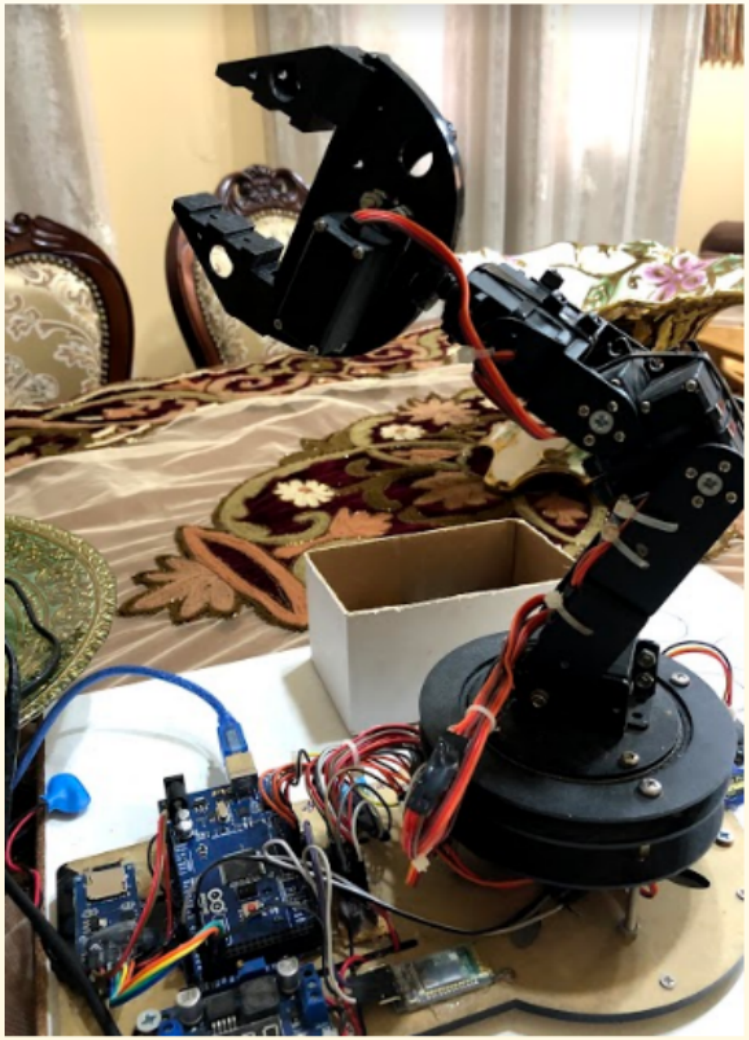
- The project scope consists of two parts, hardware and software design. For hardware part, it mainly consists of Transmitter components(Controller) & Receiver (Mechanical Arm Circuit) components.
- For software part, C/C++ programming language (Arduino language) is used to control the hardware input and output.

Objectives

- Reduce costs
- Increase productivity.
- Improve product quality.
- Eliminate harmful tasks.

Specifications

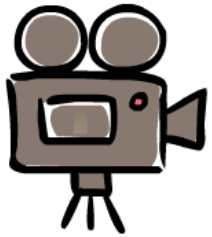




power: 9 watts
maximum load: 0.5 Kg
Accuracy: 10mm
Arm Height: 420mm
Gripper open width: 60mm

Methodology

Auto-detection mode

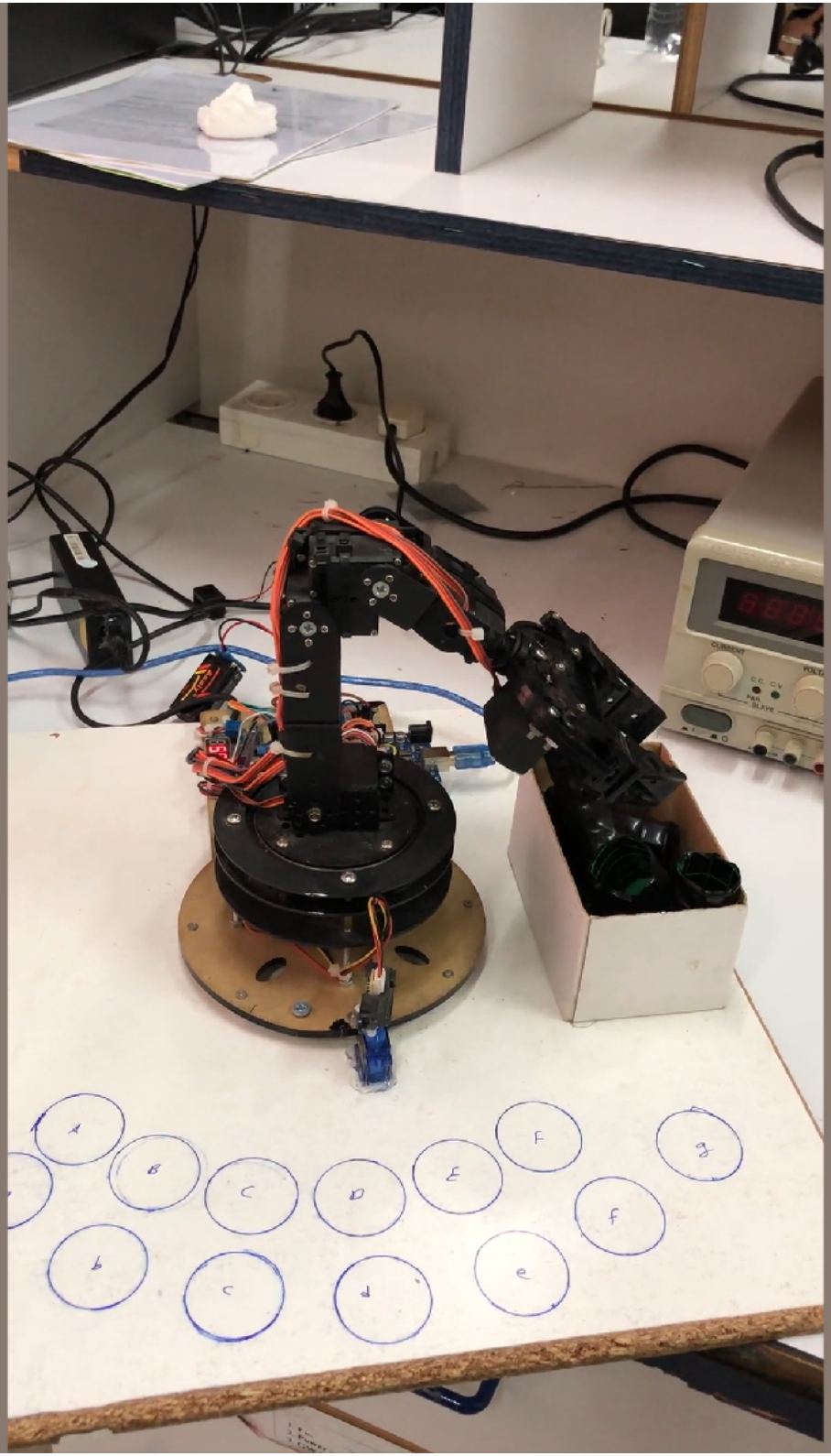


1. Scope the searching area: Automatically search the whole area until capturing an object and save it in a queue.

2.Track the object: Approach the item after detecting its position by the Sharp IR Sensor.

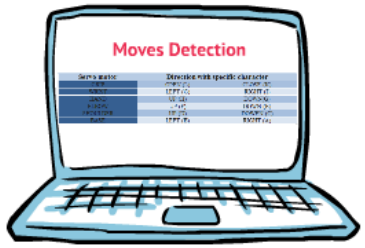
3. Collect the objects: Use the mechanical arm to pick up the detected items, and then put them into the cargo sequentially.

4. Return to user : Track the sign of the start point and start searching again or stop to reference.



Methodology

Record and repeat mode



1. Turn on Remote Control: Pair Bluetooth Either from Mobile or the manually built remote control, then press record.

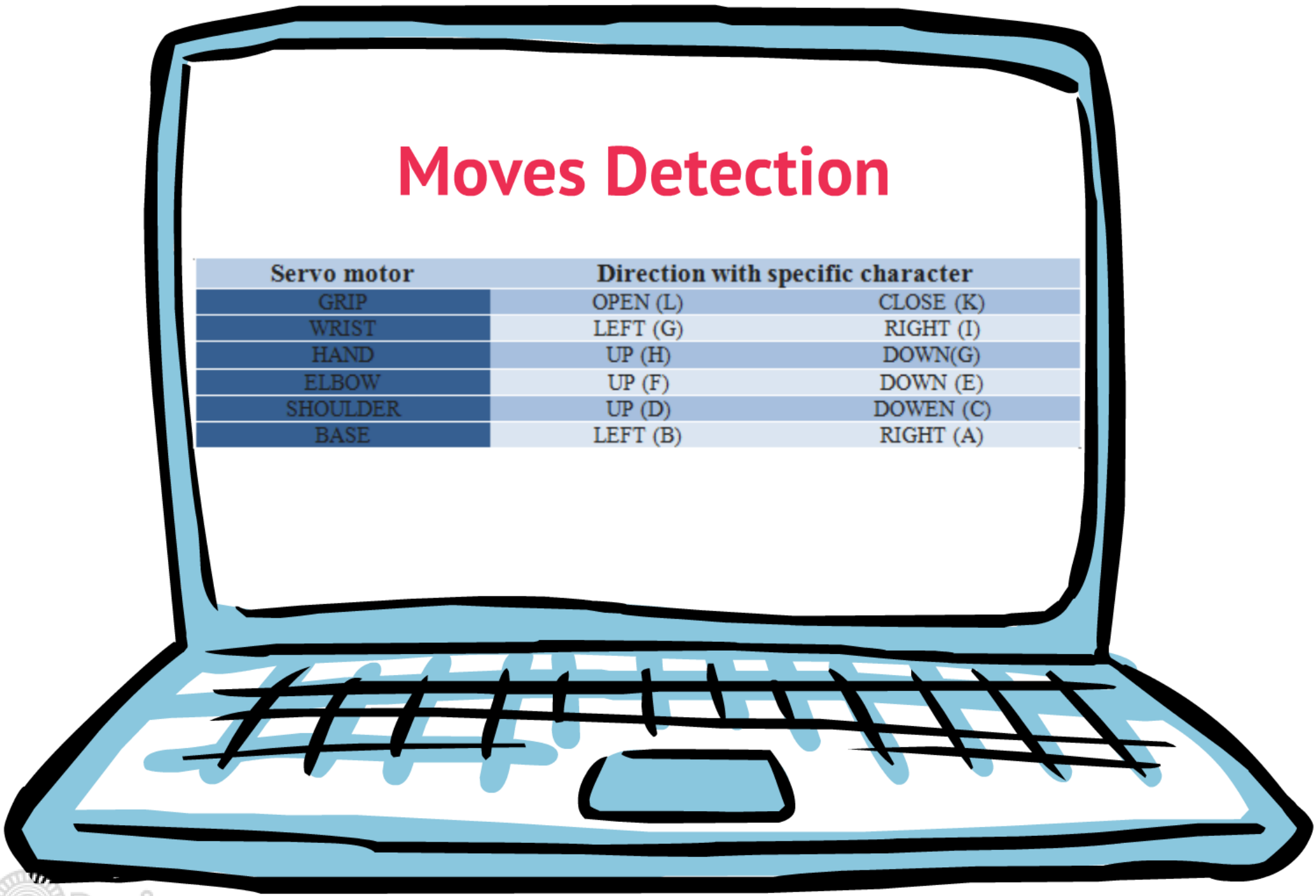
2.Take Moves from joystick or gyroscope accelmoeter: After selecting the moving joint by push buttons, the controller transmit the desired move's steps as letters.

3. Receive moves: Send the move to the arduino then to the selected servo motor on the receiver side and save the move in the SD Card.

4. Replay the saved moves : Play the recorded steps when pressing play button.

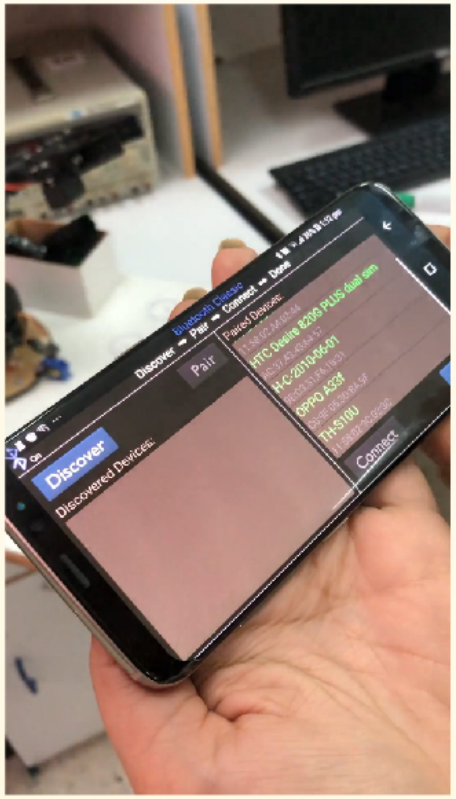
Moves Detection

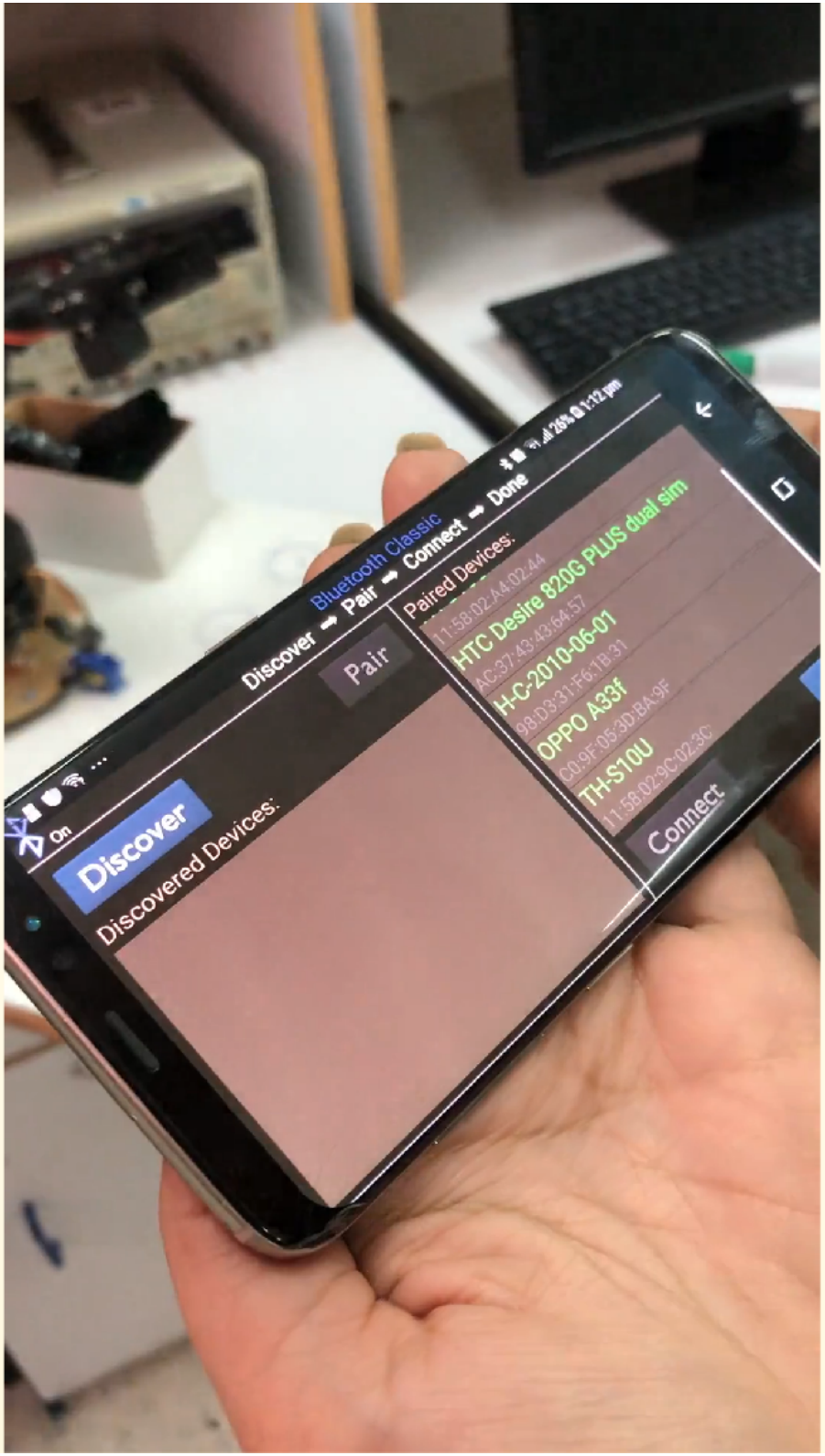
Servo motor	Direction with specific character	
GRIP	OPEN (L)	CLOSE (K)
WRIST	LEFT (G)	RIGHT (I)
HAND	UP (H)	DOWN(G)
ELBOW	UP (F)	DOWN (E)
SHOULDER	UP (D)	DOWEN (C)
BASE	LEFT (B)	RIGHT (A)



Gyroscope

Mobile Controller




Bluetooth Classic
Discover ➡ Pair ➡ Connect ➡ Done
Discover
Discovered Devices:
Pair
Paired Devices:
HTC Desire 820G PLUS dual sim
H-C-2010-06-01
OPPO A33f
TH-S10U
Connect

Hardware components

Mechanical arm components

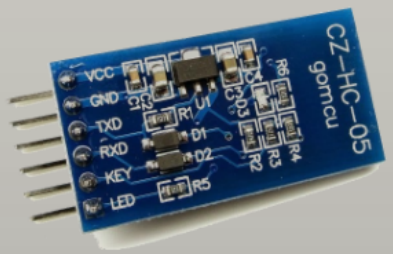
7 servo motors

PWM

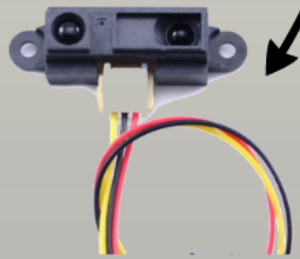
Arduino Mega

SPI Bus

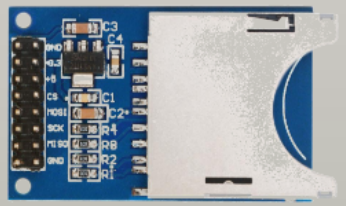
TX/RX



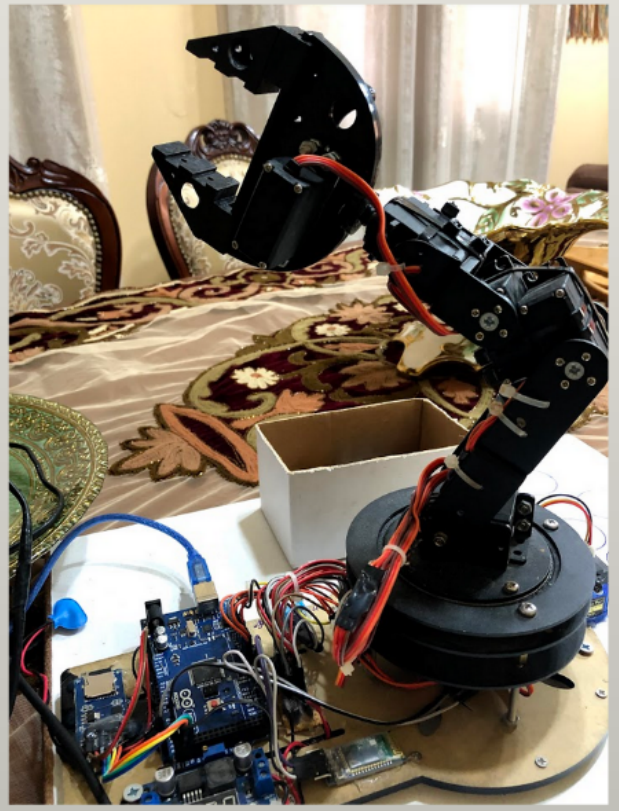
HC 05 Bluetooth Module



Sharp IR Sensor



SD Card socket



Mechanical Arm

Connections

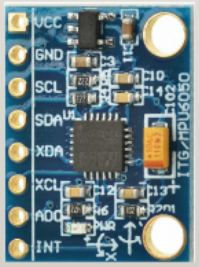
- We used Arduino Mega, Servo motor , HC 05 Bluetooth module Sharp IR sensor ,SDcard to accomplish the communication on the reciever side.
- Arduino and HC 05 transfer TX/RX signals from each other as a Master-Slave Module.
- SD Card socket connection with Arduino Mega by SPI protocol
- Servo control by pulse width modulation(PWM)
- IR Sensors produce a constantly updated analog output signal depending upon the intensity of the reflected IR ,Out put connecting with input arduino

Hardware Components

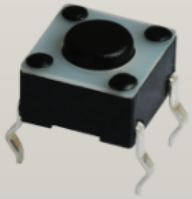
[Remote control components]

Arduino Nano

I2c Bus



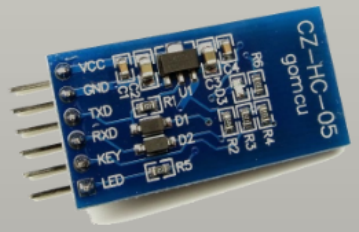
6-Axis
MPU6050-GY521



5 Push Buttons

TX/RX

9 Volts Battery



HC 05 Bluetooth Module

6 Axis Joystick

Communication

Connections

- We used Arduino Nano, MPU6050-GY521 , HC 05 Bluetooth module to accomplish the communication.
- Arduino and HC 05 transfer TX/RX signals from each other as a Master-Slave Module.
- Arduino controls the gyroscope accelometer by using I2C Bus.

Constraints

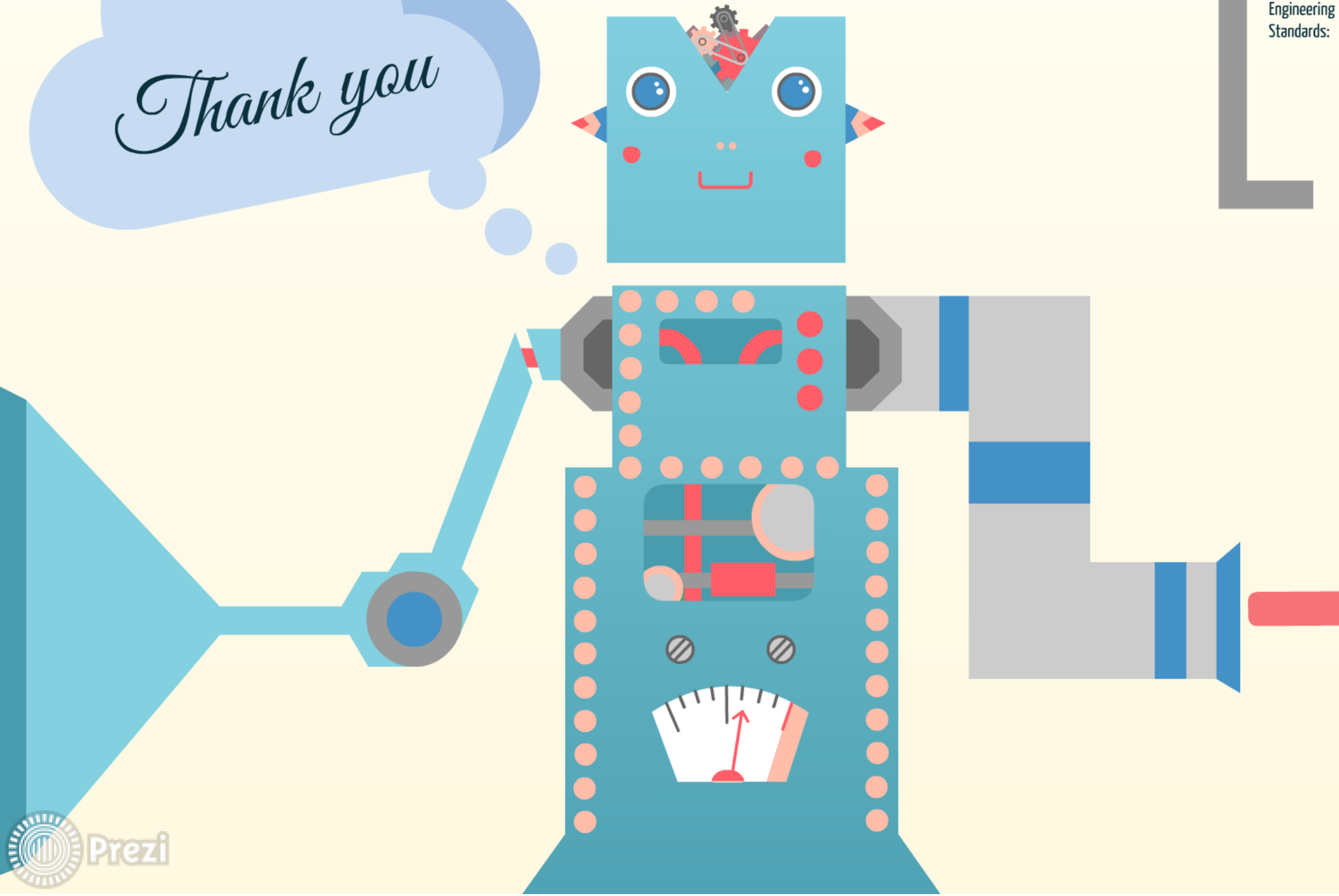
- **Power:** Energy consumption of the servo motors.
- **Arm:** Finding a suitable Arm with desired degrees of freedom.
- **Size:** Limitation of size of the gripper.
- **Time:** High speed will cause low stability.
- **Environment:** Interference and reflection of the ground.
- **Battery life:** No more than 2 hours.

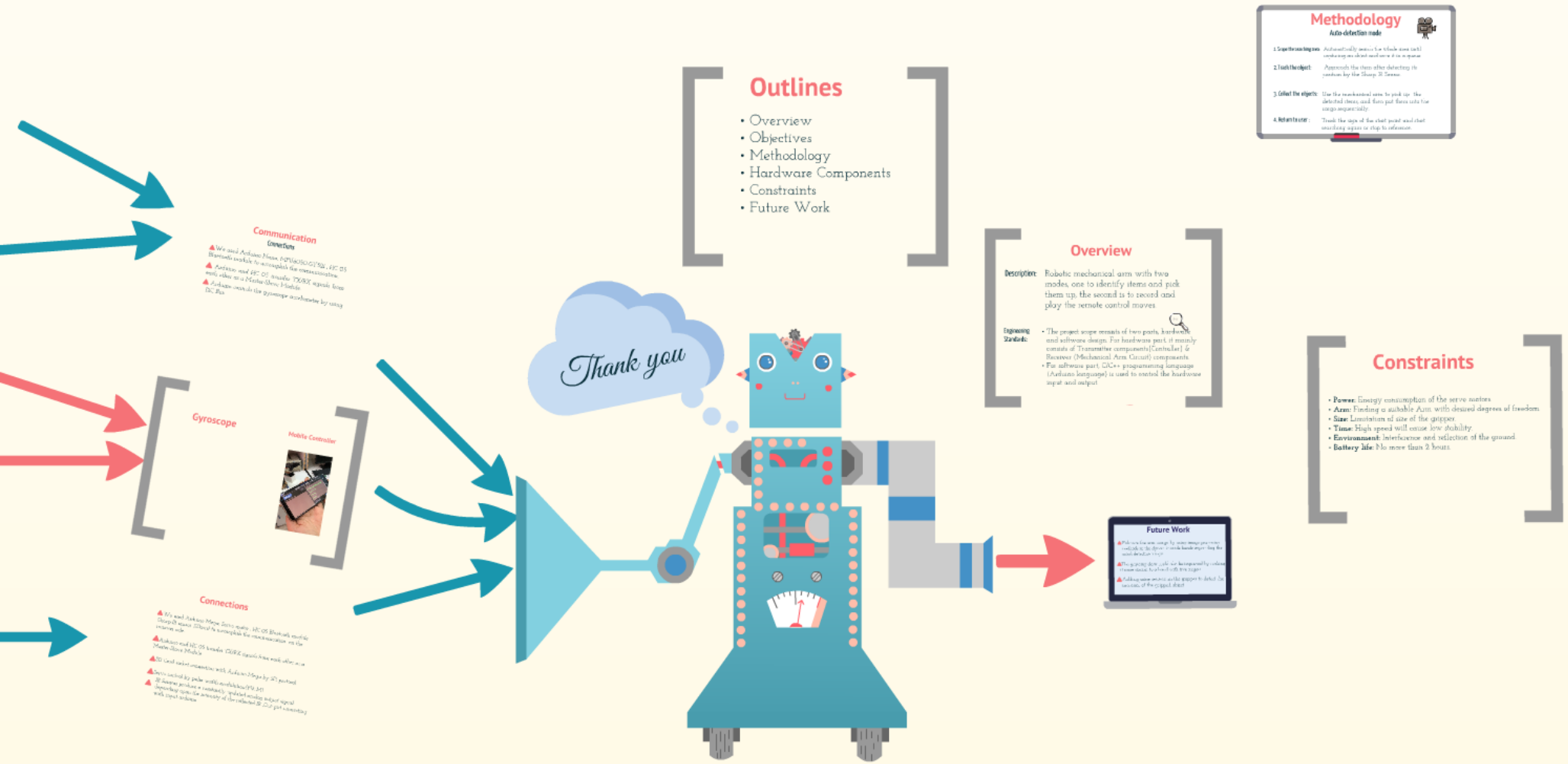
Future Work

- Enhance the arm design by using image processing methods in the dynamic mode beside expanding the arm's detection range.
- The gripping claw could also be improved by making it more similar to a hand with five fingers.
- Adding some sensors on the gripper to detect the material of the gripped object

Thank you

Engineering Standards:





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