Prince Mohammad Bin Fahd University
College of Engineering
Department of Electrical Engineering

SECRURITY ASSISTANT ROBOT

Student Name	Student ID
Latifah AlDossary	201701581
Renad AlOtaibi	201700875
Raneem AlHelal	201700784
Maryam AlHarshan	201700822

Advisors: Mr. Ahmed Abul Hussain
Co-advisor : Mr. Saifullah Shafiq

Outline

- Project Definition
- Project Objectives
- Project Specifications
- Project Constraints and Engineering Standards
- Project Architecture
- Planning
- Background
- Design: Subsystems and Component Selection
- Testing
- Result
- Project Management & Team Work
- Impact of Project
- New Skills Acquired and Applied
- Completed Work
- Estimated Budget
- References

Project Definition

“

A security assistant robot that can be controlled remotely. It has a robotic arm. This robot is provided with sensors, as well as the ability to send a live video of the work area, and it is provided with IoT specifications.

Project Objective

- **Enhance** the use of robotics in security applications.
- **Improve** security during people's absence.
- **Provide** users the ability to monitor and have better control in some places.
- **Being** able to react immediately in an urgent situation.

Project Specification

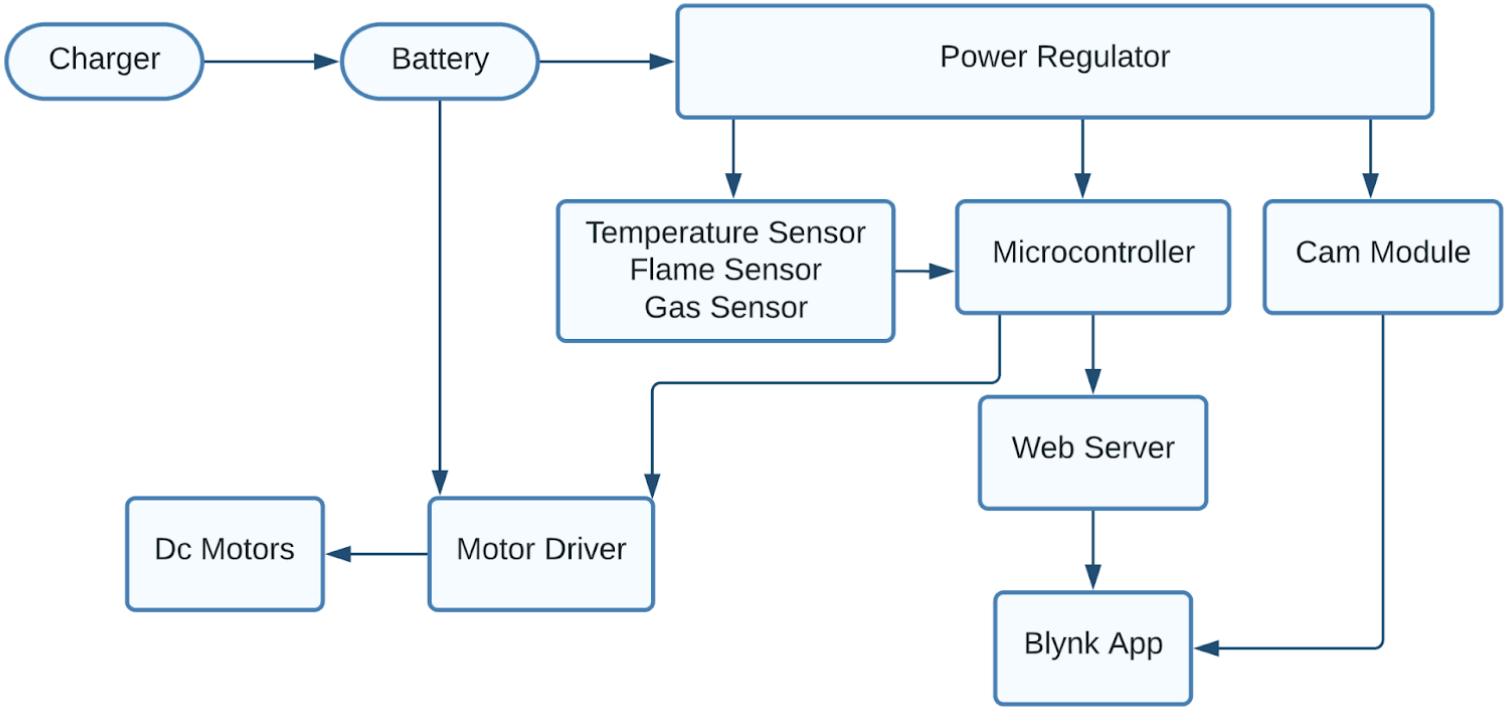
Building this prototype can be divided into four phases:

- The prototype is equipped with a camera for live video streaming to help in navigation and for operating the robotic arm.
- The prototype has a user interface with buttons to control the robot and the robotic arm.
- The prototype is remotely controlled through Wi-Fi.
- The robotic arm can be remotely operated to turn a switch on/off and to close a door.
- The prototype has a battery level indicator and a battery charging mechanism.
- The prototype detects flame, temperature, and gas sensors.
- Battery level and sensor data will be displayed on the user interface.
- The prototype can be operated for 30 minutes and up to 1 hour duration on a single charge of the battery.

Design Constraints & Standards

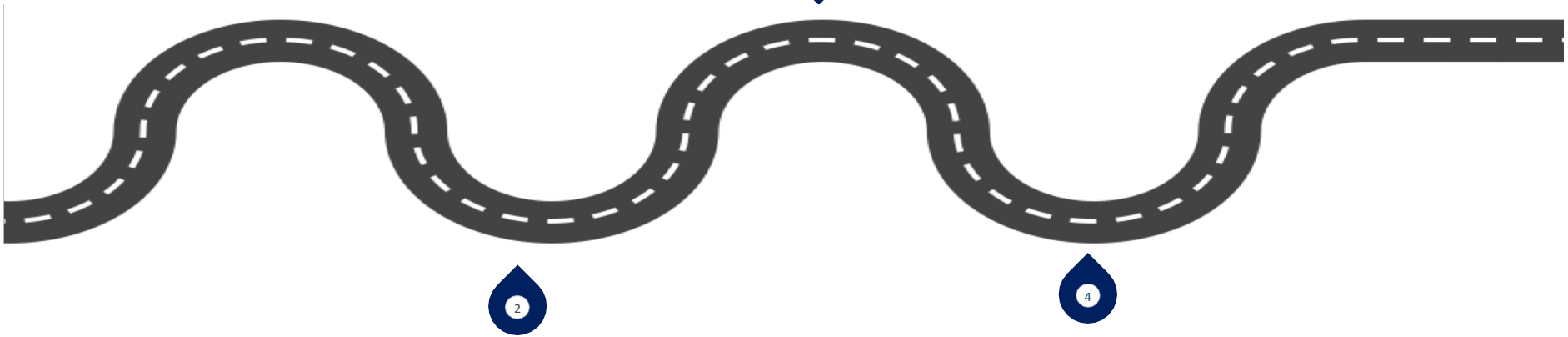
- Economic (budget)
- Safety
- Socially & culturally

Project Architecture



Planning

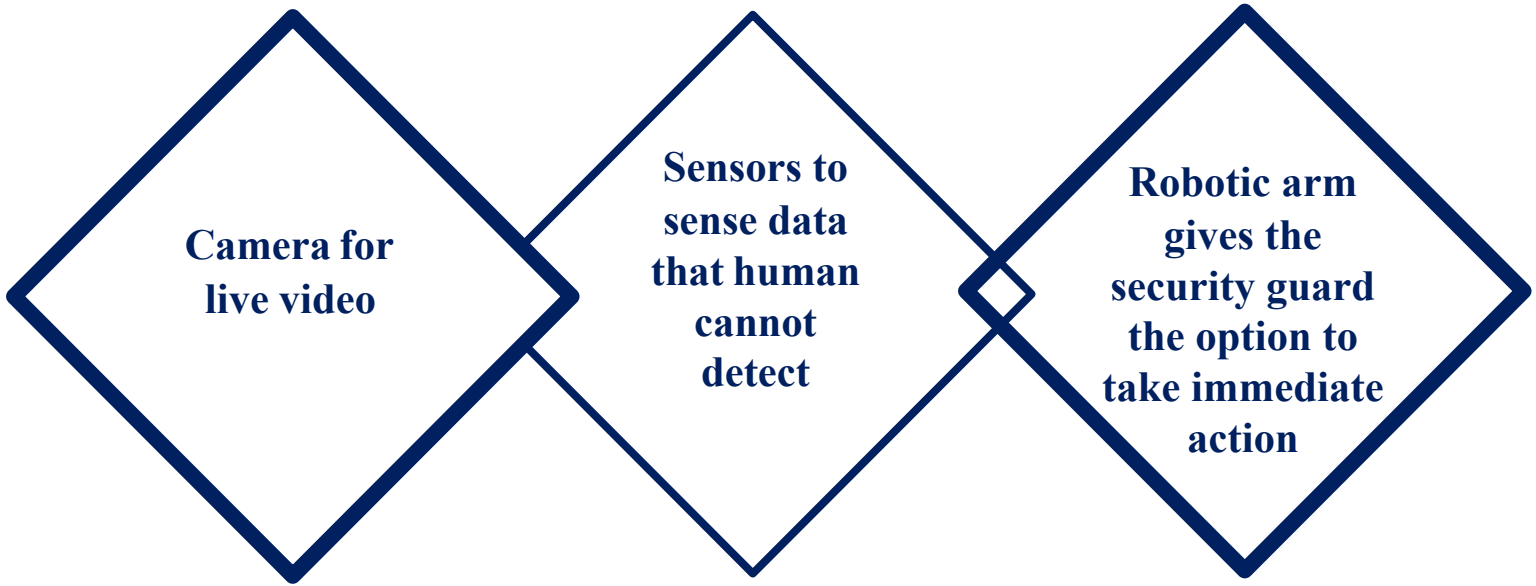
1. Dividing the project into 5 subsystems to make it feasible
2. Availability of components locally or online
3. Testing subsystems in PMU labs
4. Testing subsystems outside PMU labs



Background: Problem

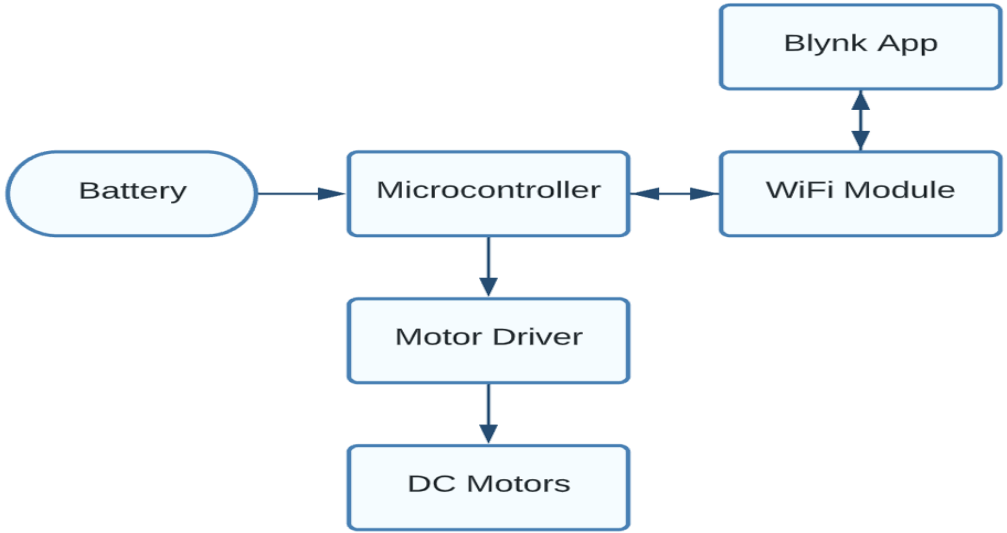
- Absence of security from the area.
- The inability of a security guard to enter the control room.
- Keeping doors open and light on while is no one in the room.
- The gas tracking process cannot be done manually.

Background: Solution



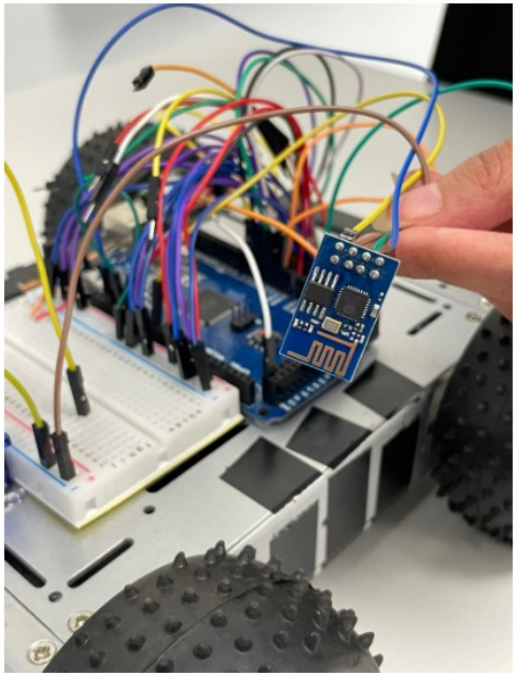
Subsystem 1

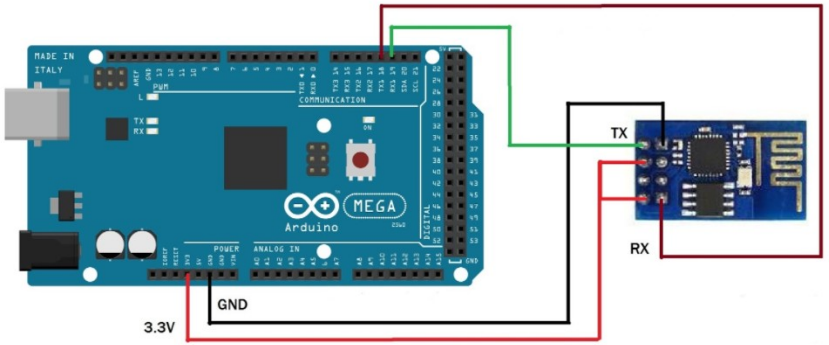
- **Design Communication Subsystem**



Subsystem 1

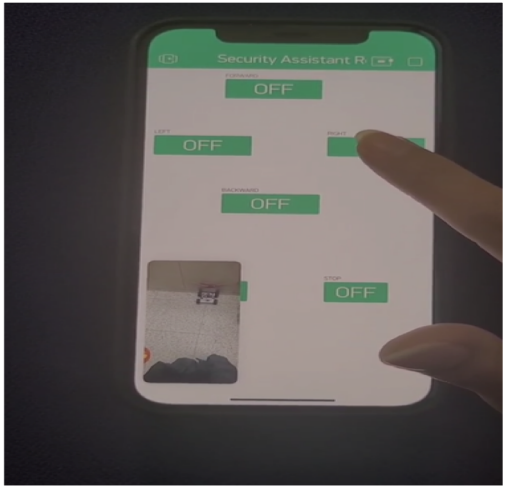
- **Test Communication Subsystem**

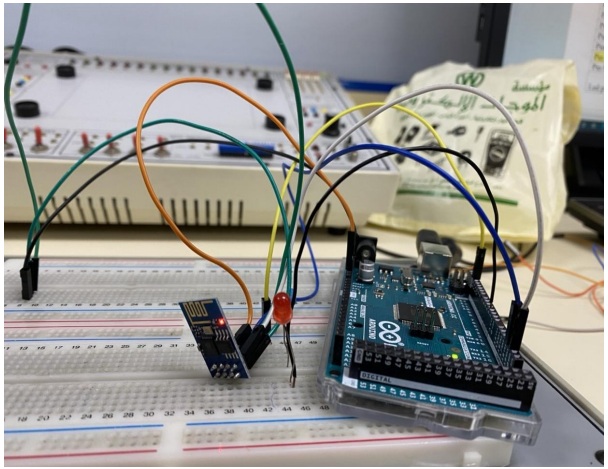




Subsystem 1

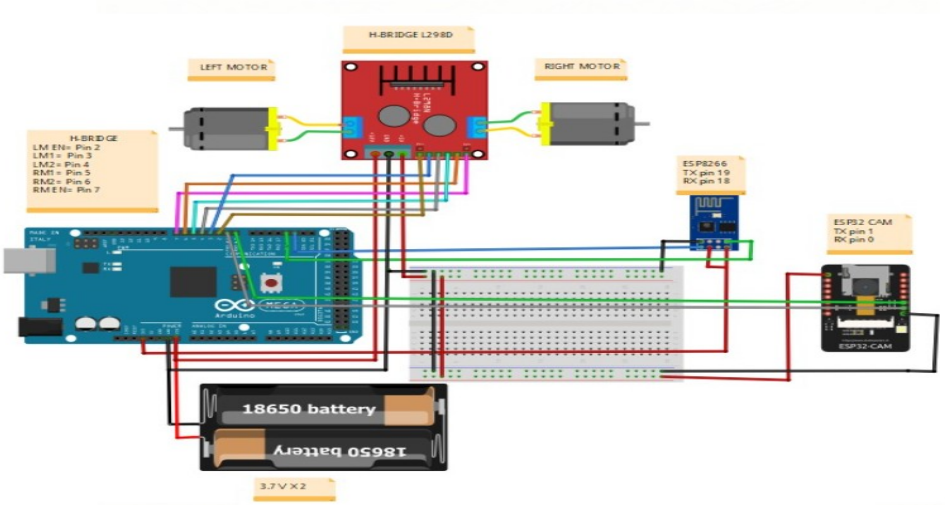
- **Result of Communication Subsystem**

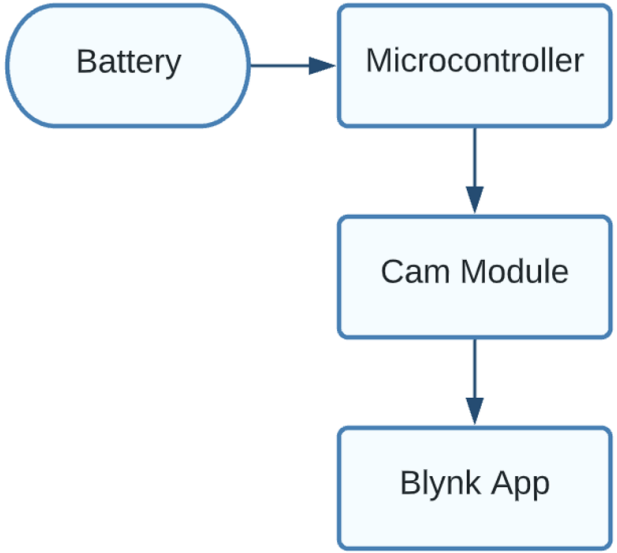




Subsystem 2

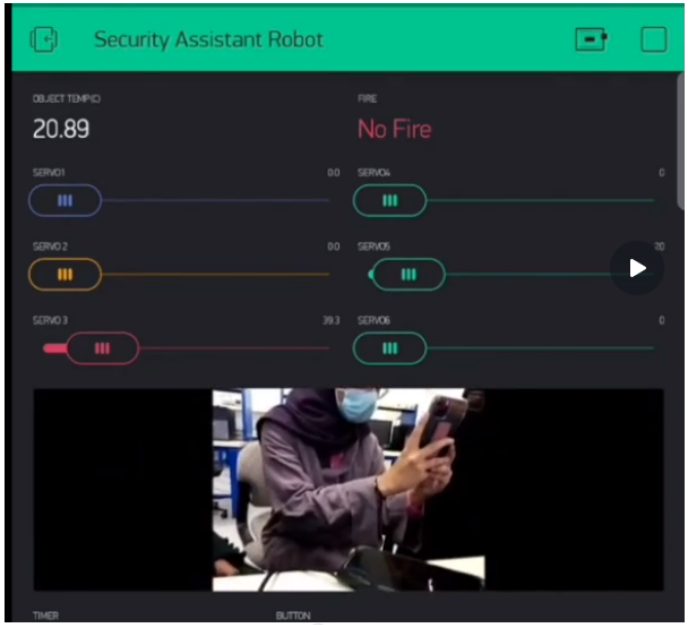
- **Design Video Monitoring Subsystem**





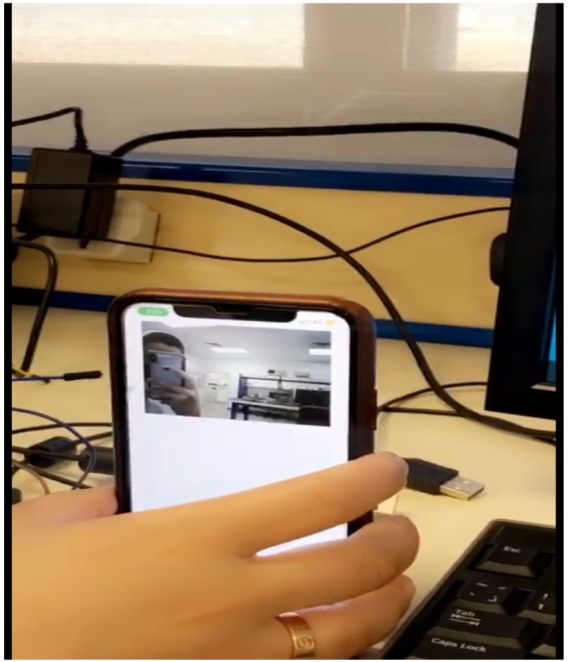
Subsystem 2

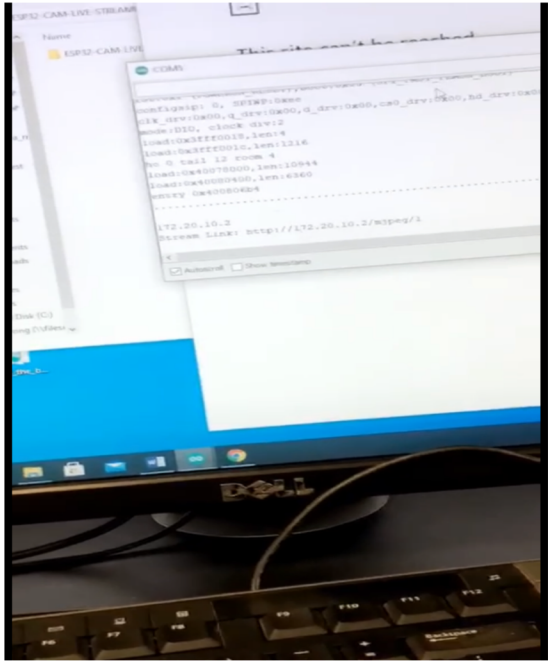
- **Test Video Monitoring Subsystem**



Subsystem 2

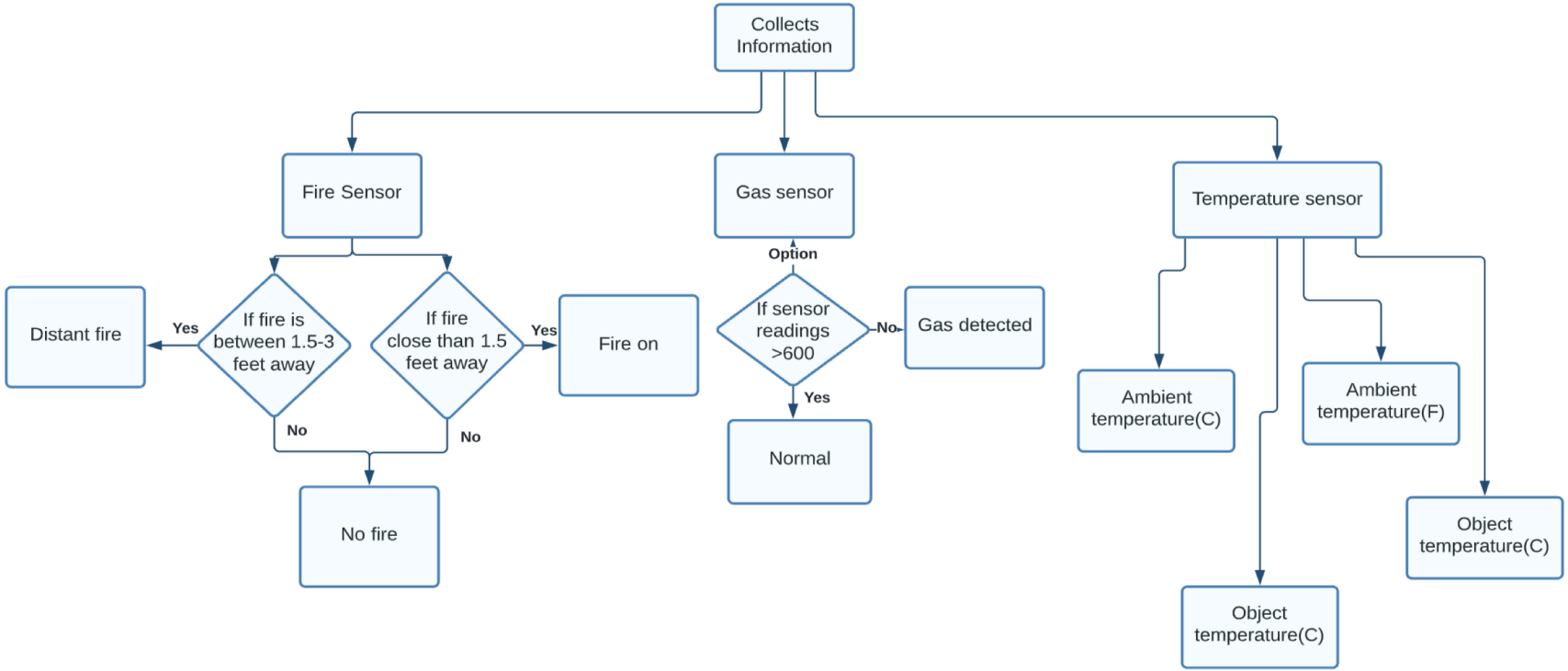
- **Result of Video Monitoring Subsystem**





Subsystem 3

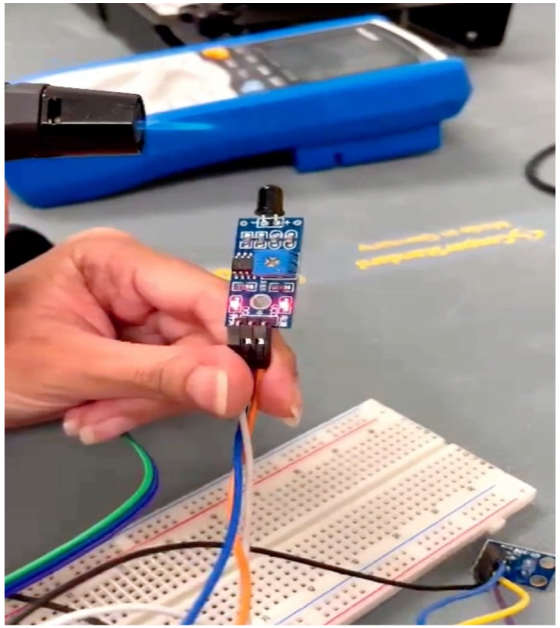
- **Design Sensors Subsystem**



Subsystem 3

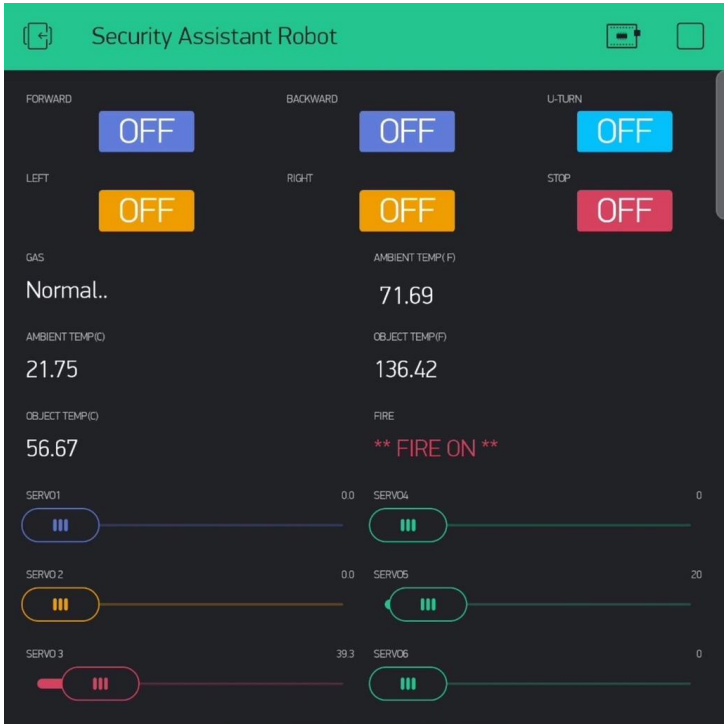
- **Test Sensors Subsystem**

Type	Level (ppm)	Status
Indoor CO2	350-400	Maximum acceptable
Atmosphere CO2	400	Average
CO2	1000-2000	Dangerous



Subsystem 3

- **Result of Sensors Subsystem**

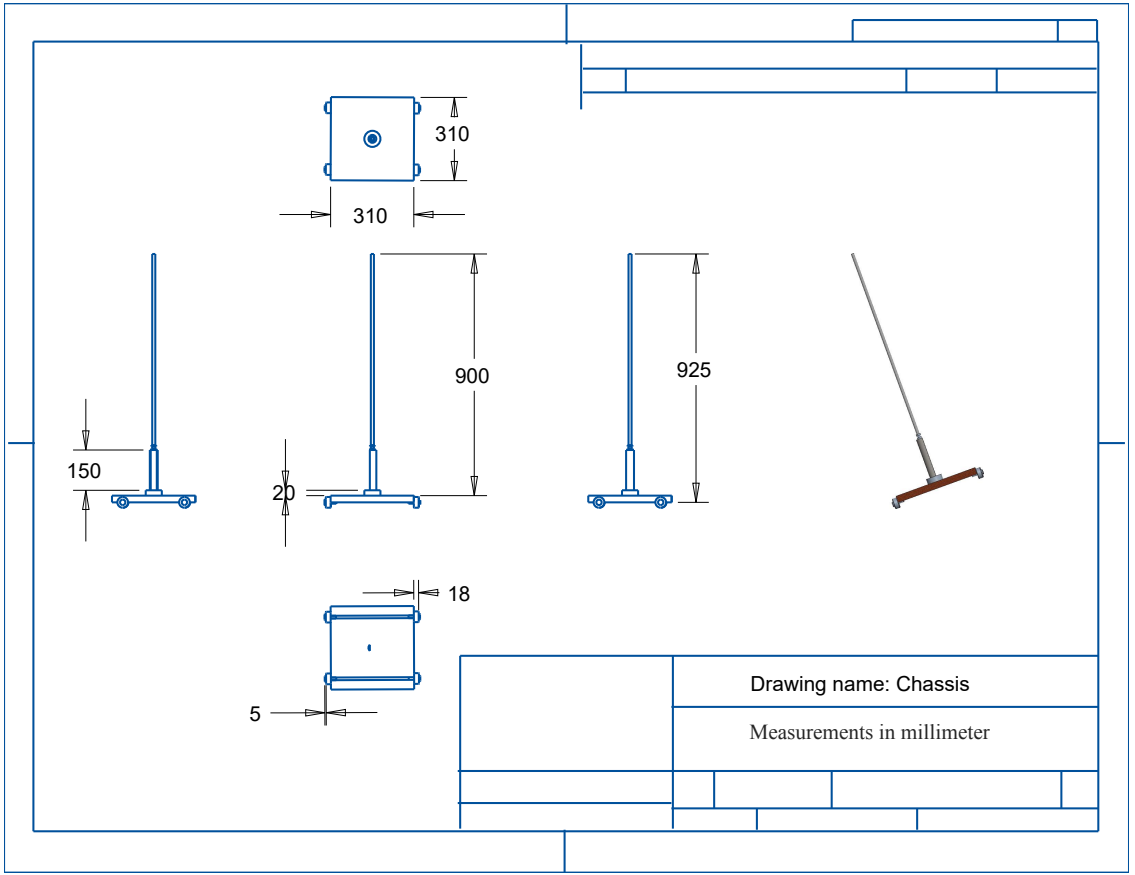


Subsystem 4

- **Design Robot Structure Subsystem:**
  - **Part A: The Chassis**
  - **Part B: The Robotic Arm**

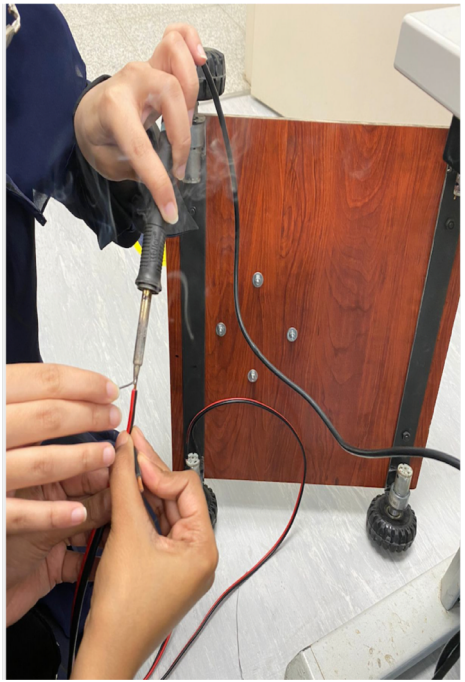
Subsystem 4- Part A

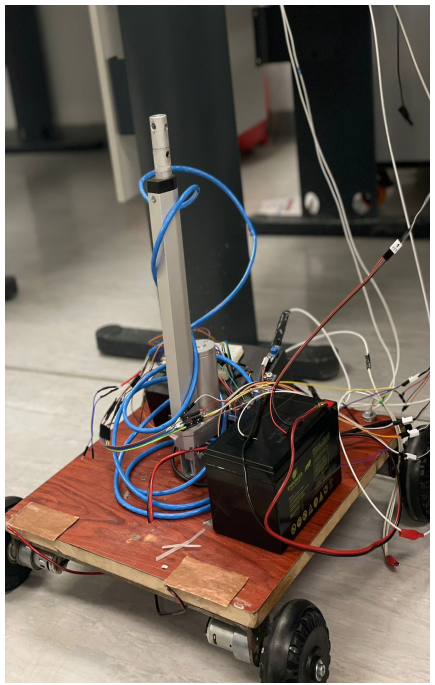
- **Design the chassis**



Subsystem 4- Part A

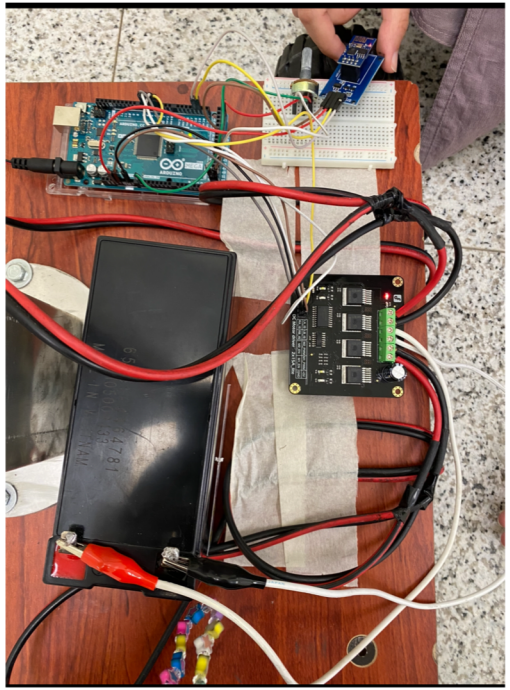
- **Design the chassis**

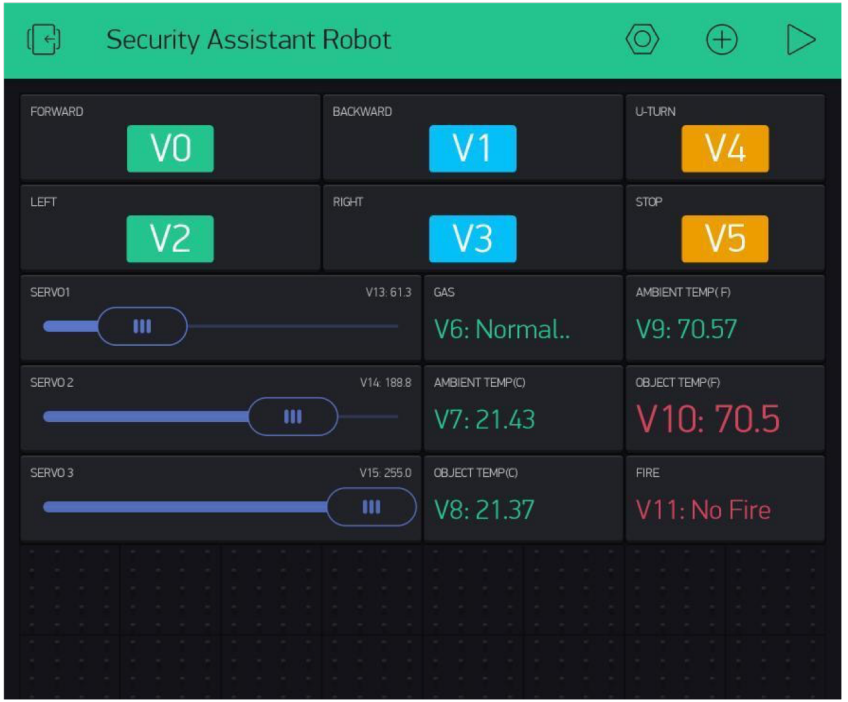




Subsystem 4- Part A

- **Test the chassis**



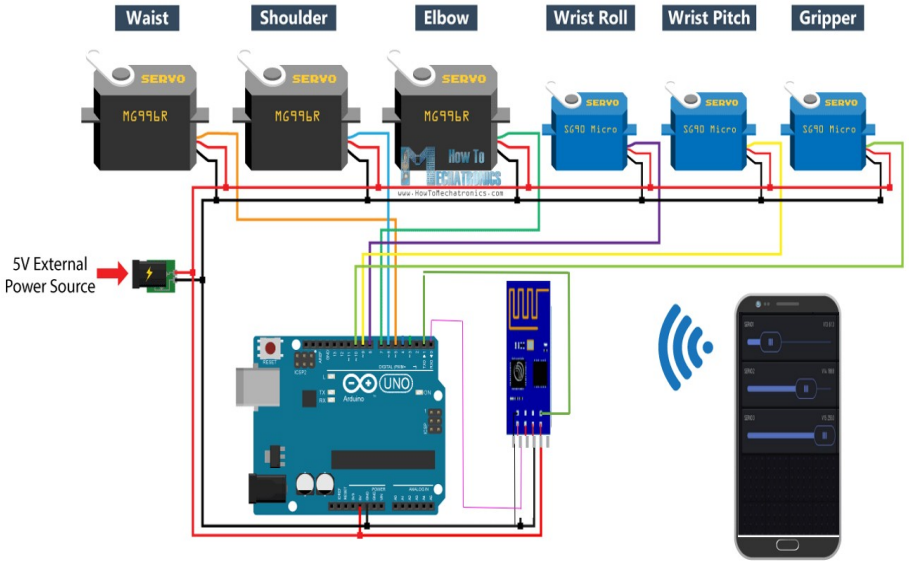


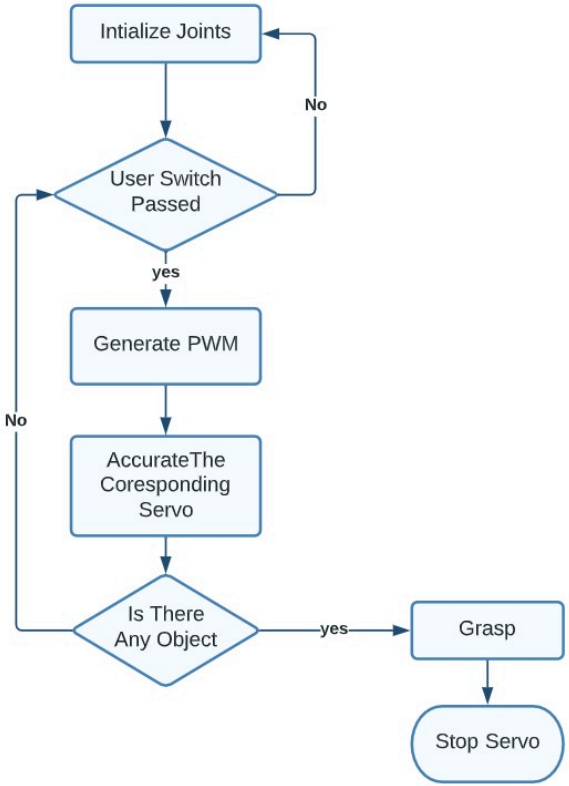
Subsystem 4- Part A

- **Result of the chassis**

Subsystem 4- Part B

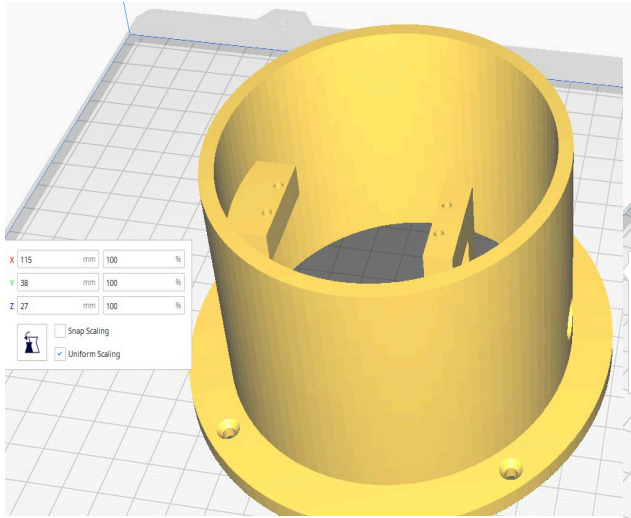
- **Design the robotic arm**

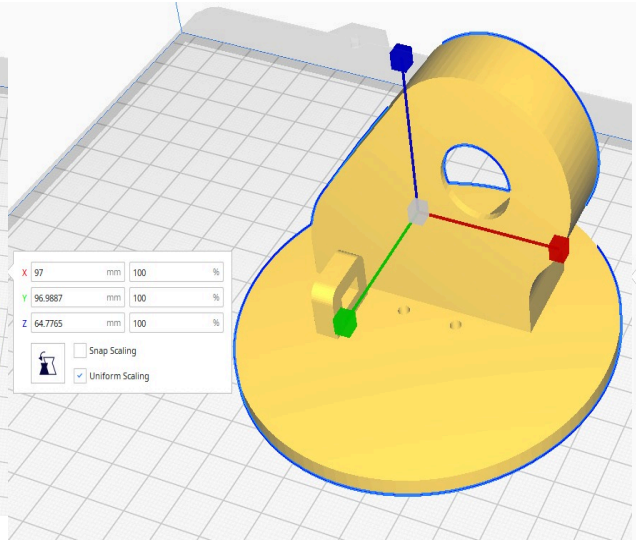


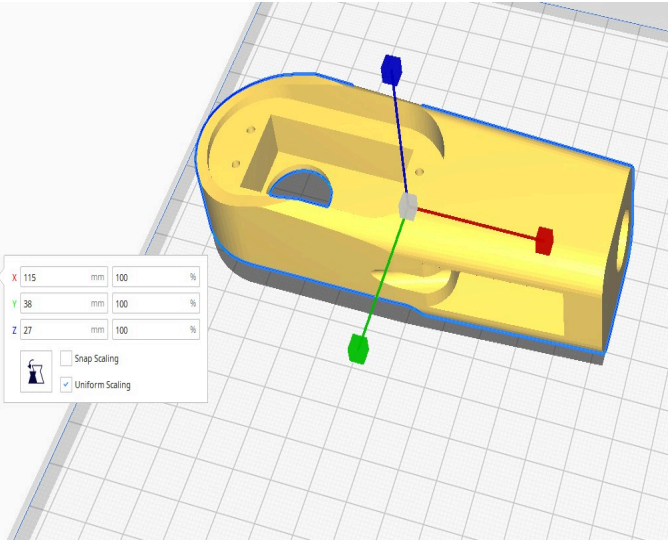


Subsystem 4- Part B

- **3D design of the robotic arm**

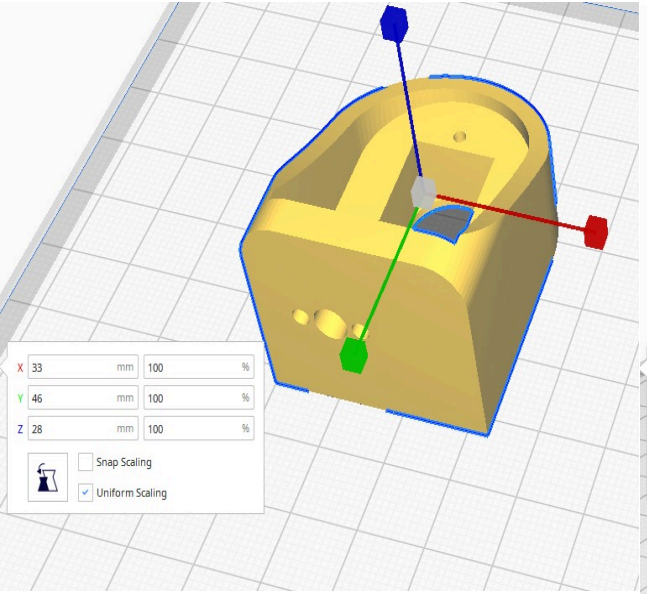


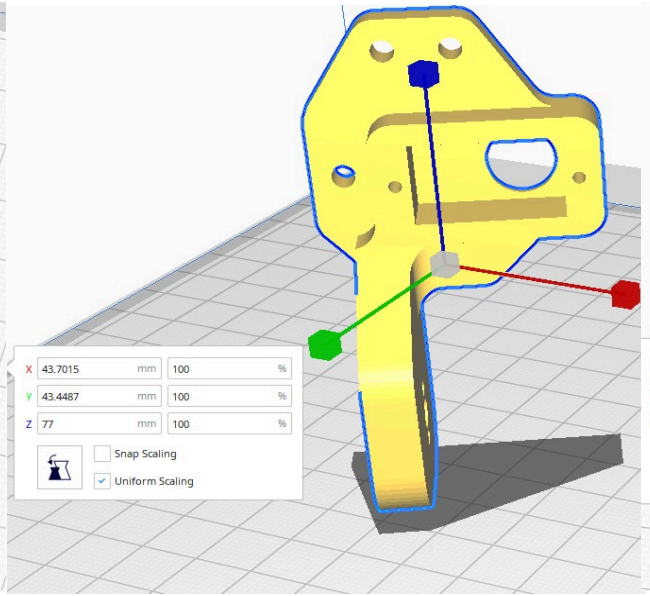


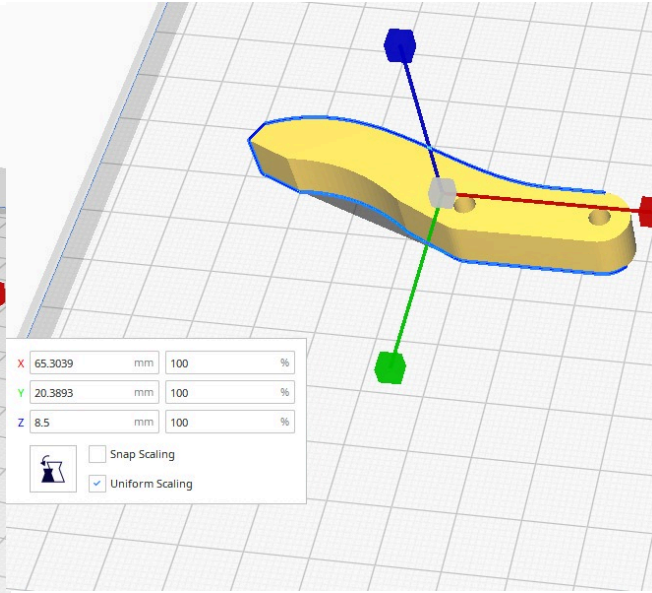


Subsystem 4- Part B

- **3D design of the robotic arm**

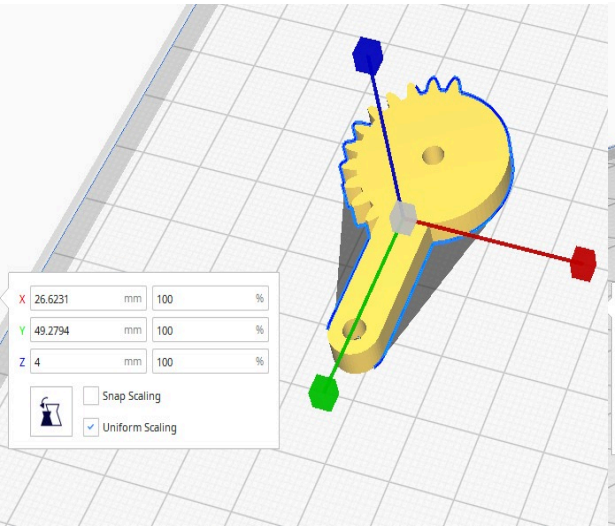


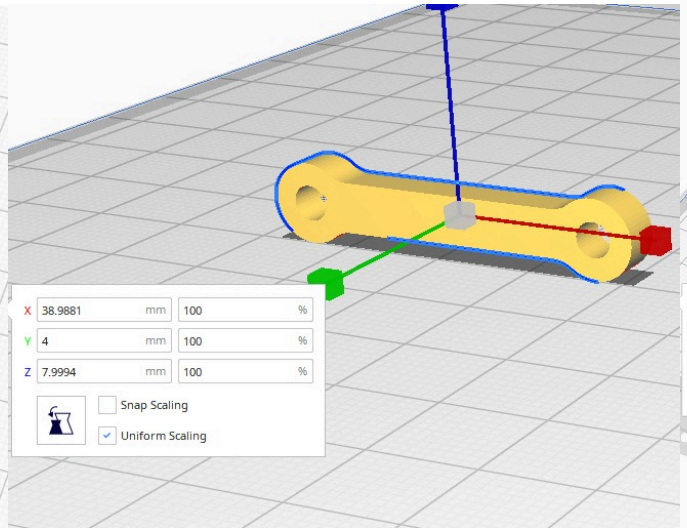


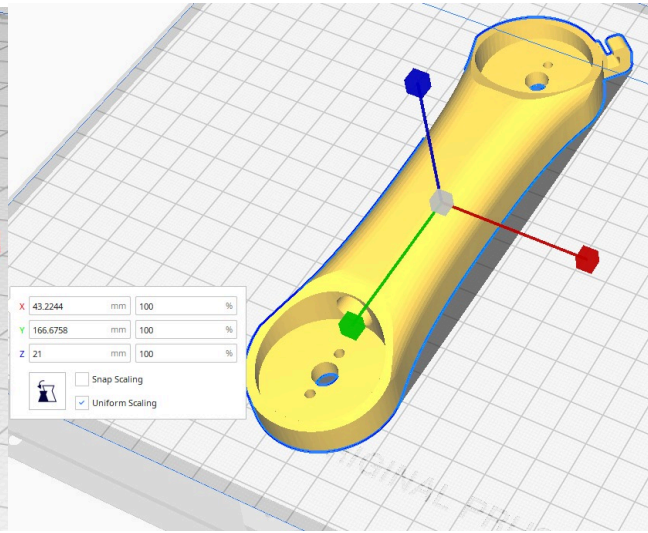


Subsystem 4- Part B

- **3D design of the robotic arm**

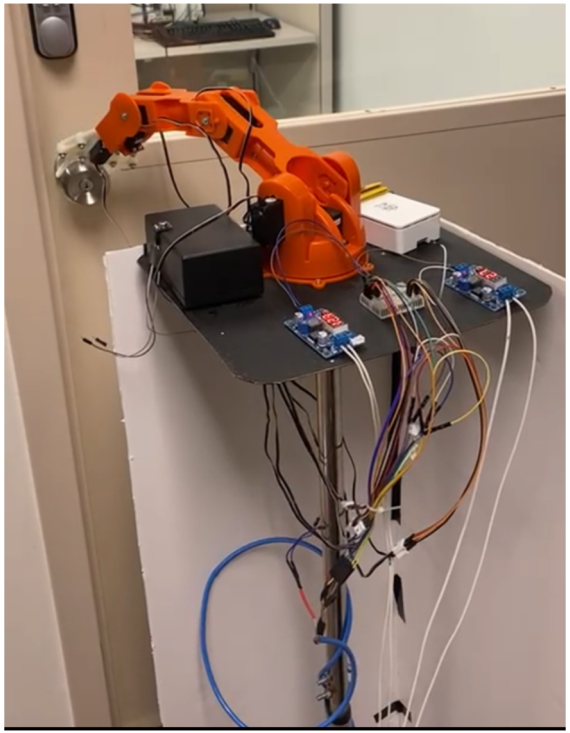


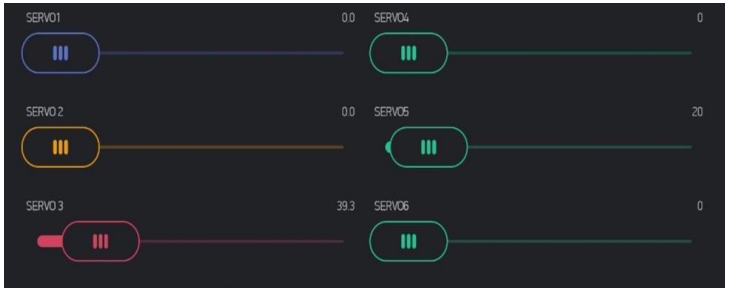




Subsystem 4 Part B

- Test the robotic arm



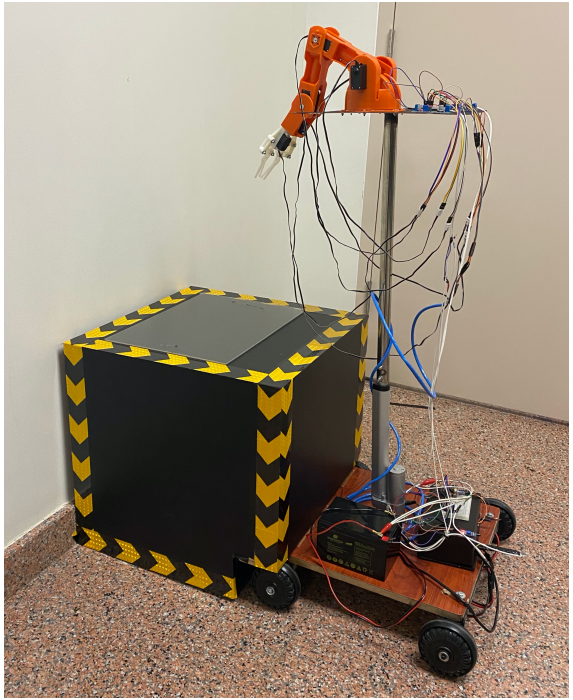


Subsystem 5

- **Design battery charging mechanism subsystem.**

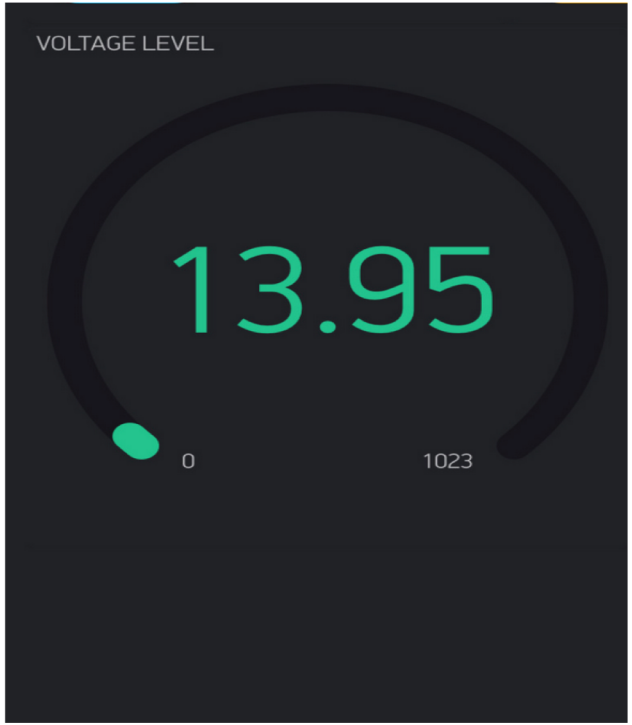
Subsystem 5

- **Test battery charging mechanism subsystem.**



Subsystem 5

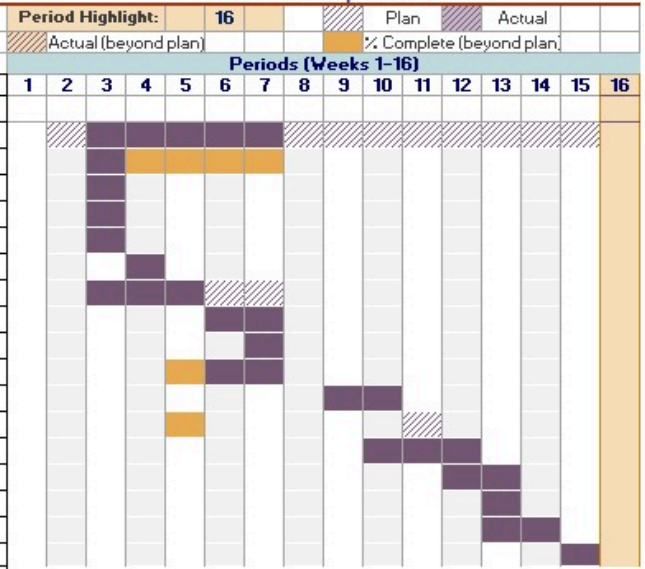
- **Result of the battery charging mechanism subsystem**



Project Management & Team Work

Title: Security Assistant Robot	Advisor: Mr. Ahmed Abulhussain , Co-Advisor : Saifu	Design II (ASSE 3)	Spring 2022
Latifah AlDossary (LD) 201701581		Project PLAN & Progress	
Renad AlOtaibi (RO) 201700875		ProgRpt No. 6	
Maryam AlHarshan(MH) 201700822		Plan updated (Date): may 17, 2022	
Raneem AlHelal (RH) 201700784		Instructor: Dr. Sadiq Alhuwaidi	

ACTIVITY	PLAN START	PLAN DURATION	Assigned To	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Write a plan	1	1	ALL	1	1	100%
Progress report	2	14	ALL	3	5	100%
Design the chassis	3	1	ALL	3	5	100%
Test Flame sensor (subsystem 3)	3	1	LD,RH	3	1	100%
Test Gas sensor (subsystem 3)	3	1	RO,MH	3	1	100%
Test Temperature sensor (subsystem 3)	3	1	LD,RH,RO	3	1	100%
Test all sensors together (subsystem 3)	4	1	RO,MH	4	1	100%
Design the robotic arm (subsystem 4)	3	5	ALL	3	3	100%
Intgrates the robot stracture	6	2	ALL	6	2	100%
Prepare midterm presentation and video	7	1	LD,MH	7	1	100%
Test the robotic arm (subsystem 4)	6	2	ALL	5	3	100%
Design battery charging mechanism (subsyst	9	2	ALL	9	2	100%
Design the user's interface (subsystem 2)	11	1	MH,RO	5	1	100%
Integrate 4 subsystems together	10	3	ALL	10	3	100%
Prepapre final report	12	2	MH,RO	12	2	100%
Prepapre final presentation	13	1	LD,RH	13	1	100%
Prepare project demo	13	2	ALL	13	2	100%
Submit Rpt/PPT/Brochure/Video_etc.	15	1	LD	15	1	100%



Progress Details:

Issues (delay, etc.):

Project Management & Team Work

Task	Maryam	Renad	Latifah	Raneem	Total Percentage
Search & Acquire Components	20%	20%	40%	20%	100%
Write Reports & Presentations	25%	25%	25%	25%	100%
Design & Implement Subsystem 1	25%	25%	25%	25%	100%
Design & Implement Subsystem 2	0%	0%	50%	50%	100%
Design & Implement Subsystem 3	25%	25%	25%	25%	100%
Design & Implement Subsystem 4	25%	25%	25%	25%	100%
Design & Implement Subsystem 5	25%	25%	25%	25%	100%
Testing	25%	25%	25%	25%	100%
Design user's interface	50%	50%	0%	0%	100%
Write Reports & Presentations	25%	25%	25%	25%	100%
Final presentation & Video	25%	25%	25%	25%	100%

Risk Management

Risk Description	Risk Management	Impact
Unavailability of components	Ordering the components online	Saves the time
Chassis dimentions	Calulating the wieght, torque , and measuring the distances	Safer and reduce financial losses
Soldering the ball Bering with the shaft	The wheels were overloaded and while testing it moves out of it’s place	The control become easily to the left and right side
Blynk app	The ESP8266 keeps disconnecting	We use independent WIFI
Trouble shooting	Design mistakes	A few design mistakes
Gripper	Double the gripper	It become stronger
Length of the arm	Reprint the middle piece to make longer	Reaches the light and the knob of the door

Impact of Project

- **Society:** Protects people from fire danger.
- **Economy:** Reduces the number of employees. Electricity consumption.
- **Environment:** Preserves the environment from pollution.

New Skills Acquired and Applied

New Skills Acquired:

- Working according to specific budget
- Finding the problem and fixing it
- Programming
- 3D modeling
- Using Blynk App
- Using Raspberry pi

New Skills Applied:

- Planning.
- Following a precise plan.
- Connecting components together.
- Troubleshooting.
- Decision making.

Completed Tasks

- Subsystem 1: Communication.
- Subsystem 2: Video Monitoring.
- Subsystem 3: Sensors.
- Subsystem 4 : Design Robot Structure.
- Subsystem 5 : Battery Charging Mechanism.
- Integrate All 5 Subsystems.
- Design The User's Interface.

Estimated Budget

Items	Quantity	Unit cost (SR)	Subtotal (SR)
Raspberry Pi	1	484	484
Raspberry Pi camera	1	105	105
Arduino Mega	2	250	500
Micro Servo Motor Metal Servo Motor	3 3	28 69	84 207
IR Temperature Sensor	1	92	92
Fire Sensor	1	28.25	28.25
Gas Sensor	1	40.25	40.25
The Chassis Structure	1	300	300
Wheels	4	23	92
Lenovo Tablet	1	550	550
Robot Arm 4DOF	1	850	850
WIFI Module	1	35	35
Dc Motor	4	36	144
Linear Actuators	1	600	600
Step Down Voltage Regulator	2	34.5	69
Total	4180.5		

=

Conclusion

THANK YOU FOR LISTENING !

References

Su, H., & Chen, K. (2017). Design and implementation of a mobile robot with autonomous door opening ability. *2017 International Conference On Fuzzy Theory And Its Applications (Ifuzzy)*. doi: 10.1109/ifuzzy.2017.8311808

design the robot as a security system in the home. (n.d.). Retrieved October 2, 2021

J. Han, S. Ji, K. Kim, S. Lee and B. Choi, "Collective robot behavior controller for a security system using open SW platform for a robotic services," 2011 11th International Conference on Control, Automation and Systems, 2011, pp. 1402-1404.

Marek, Gašparík & Peter, Šolek. (2014). Design the Robot as a Security System in the Home. Procedia Engineering. 96. 10.1016/j.proeng.2014.12.130.