Learning Outcome Asse. III EE_2021

Solar Panel Cleaning System

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OUTLINE

- Project Definition
- Project Objectives
- Project Specifications
- Design: Subsystems and Component Selection
- Project Management & Team Work
- Budget Estimation

Project Definition

To build a fast and efficient automatic system for cleaning, detecting, and monitoring solar panels. The system will speed up the cleaning process, detecting weather factors, monitoring the outcomes and the efficiency of the solar panels thus, that will make the process safer, sustainable, and more economical to use.

Project Objectives

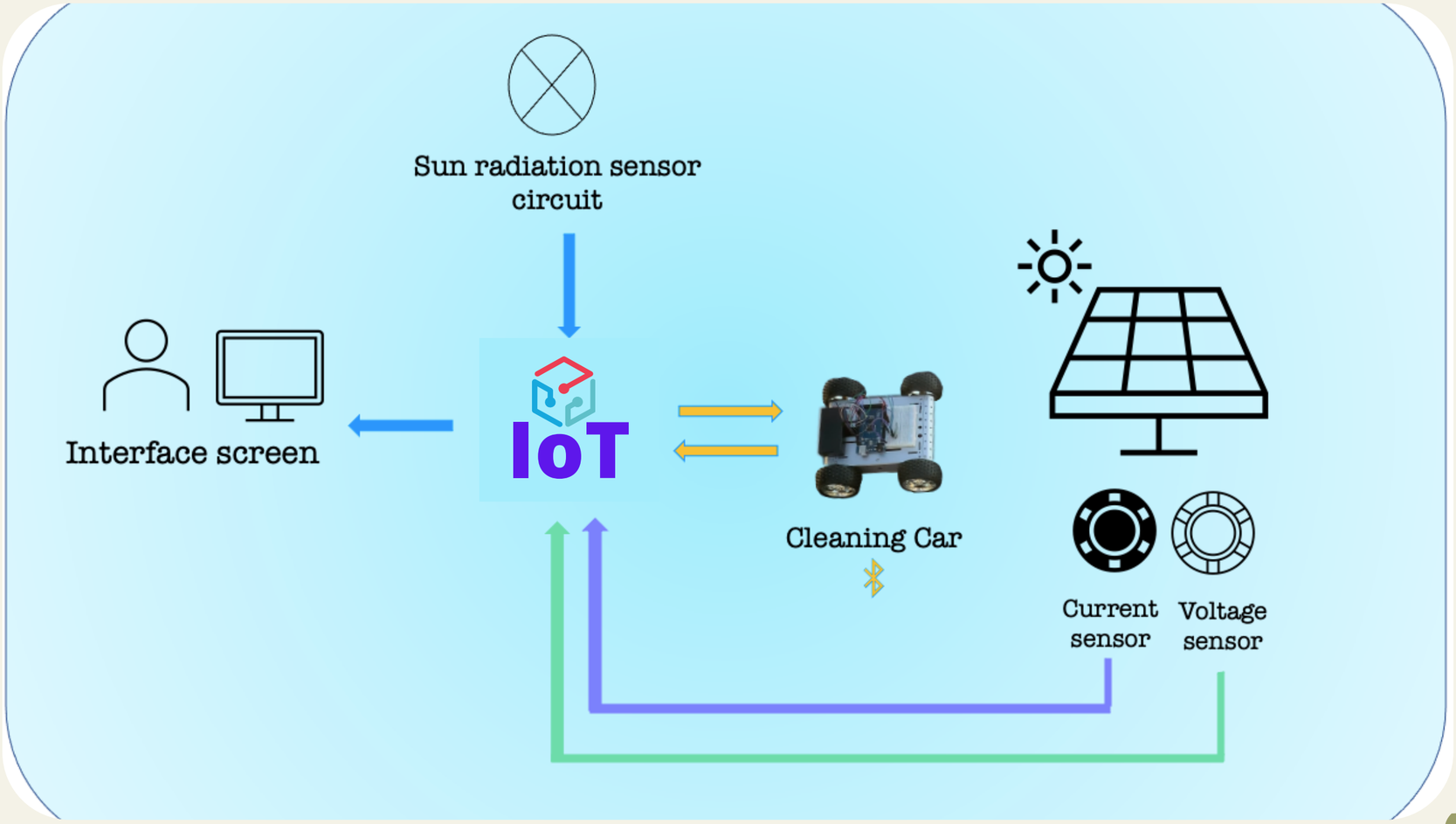
- Increase solar panels efficiency and performance
- Facilitate tracking, communication, and situational awareness in Solar Panel areas
- Encourage sustainable life by using an environmentally friendly robot.
- Ensure the safety and effective deployment of solar systems more especially promoting more effective and less human intervention way of doing maintenance on solar panels.

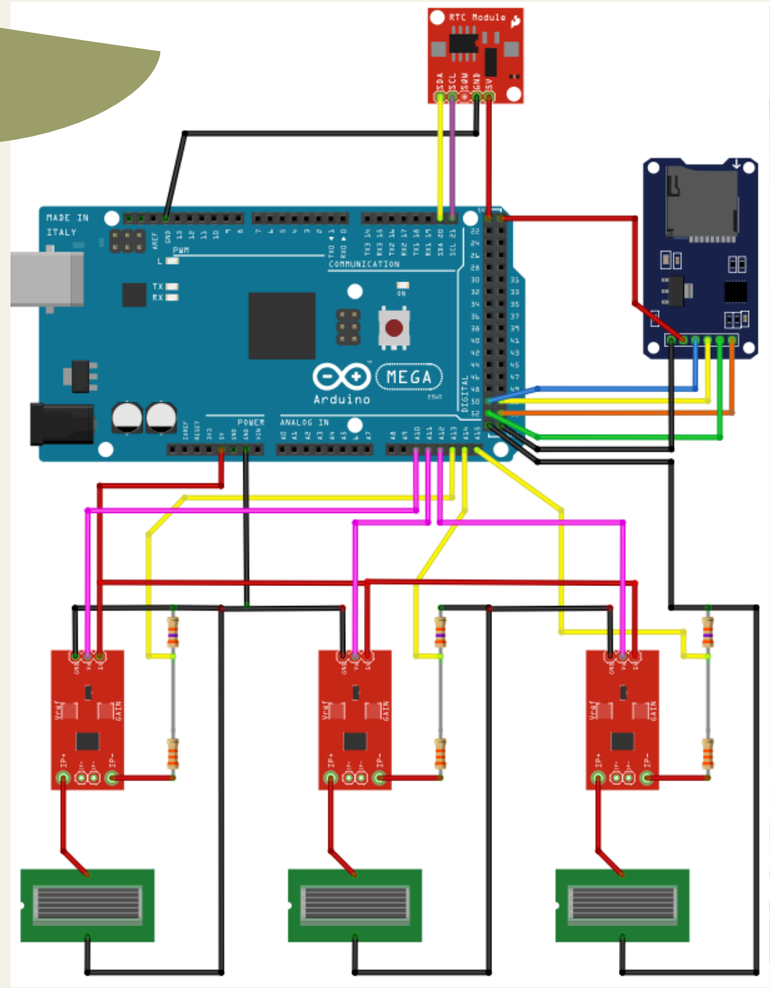
Project Specifications

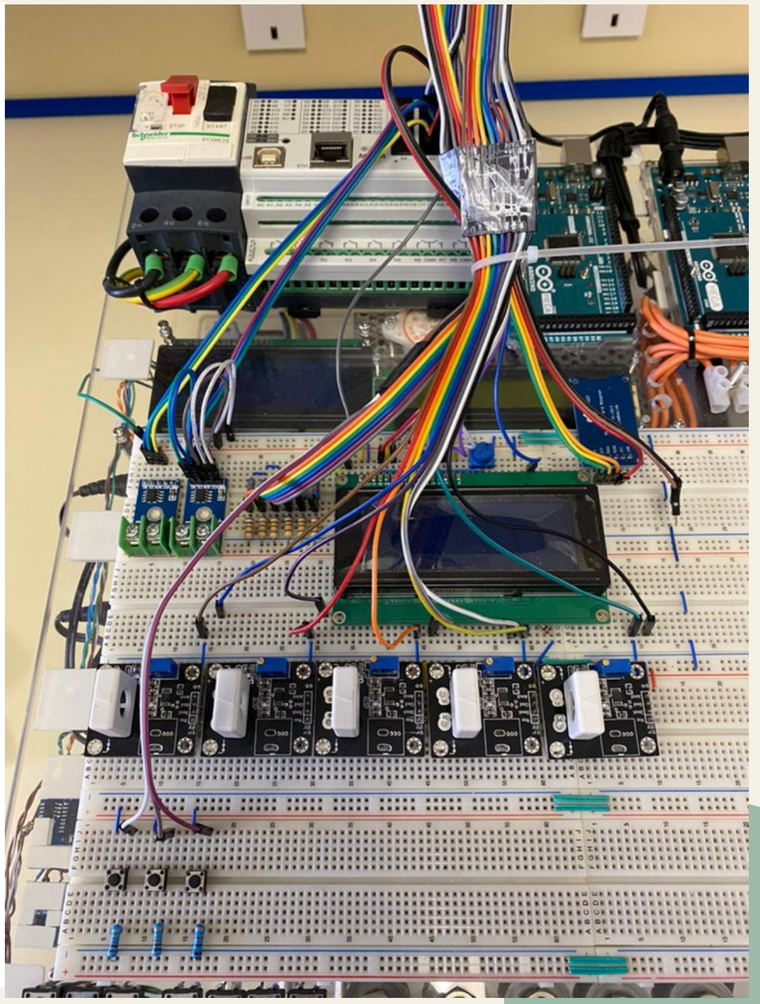
Design and testing of various subsystems would be included in the project. The following goal specifications will be fulfilled by each subsystem.

- The robot designed to be used for automated and independent cleaning on solar panels.
- Improve Overall Efficiency 10 %.
- Measures the accumulated dust on the solar panel to start the cleaning process.
- X-Y directions movement.
- Stand movement from 0 to 30 degrees.

Project Architecture

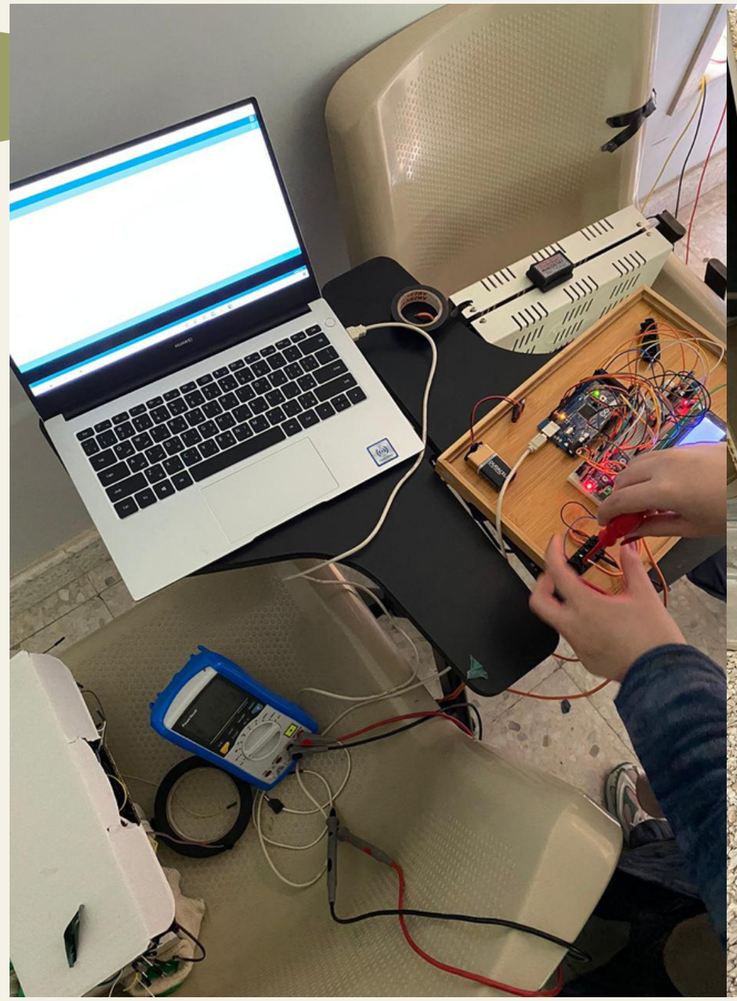






Design: Structure

Subsystem 1 : Current and Voltage Detection

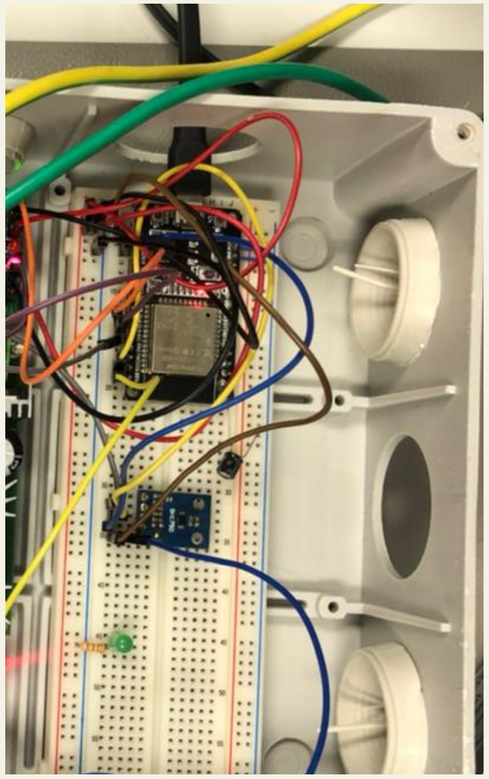


Design: Testing

Subsystem 1 : Current and Voltage Detection

Design: Testing

Subsystem 1 : Current and Voltage Detection (Light Intensity Sensor)



Design: Testing

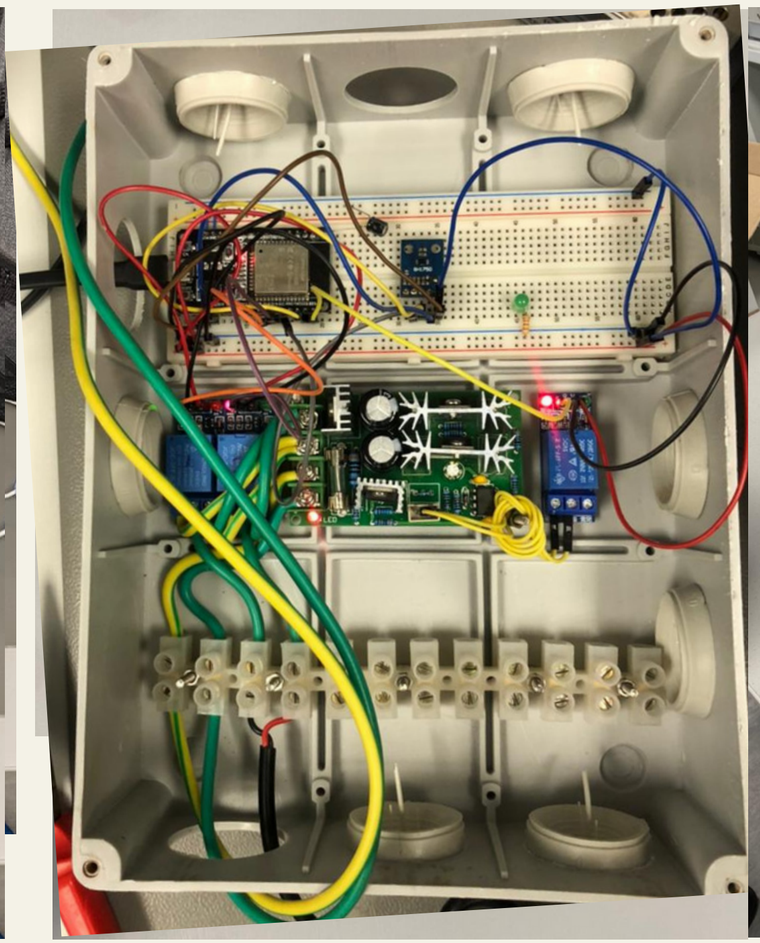
Subsystem 2: Intelligently Controlled Movement of Solar Panel Stand

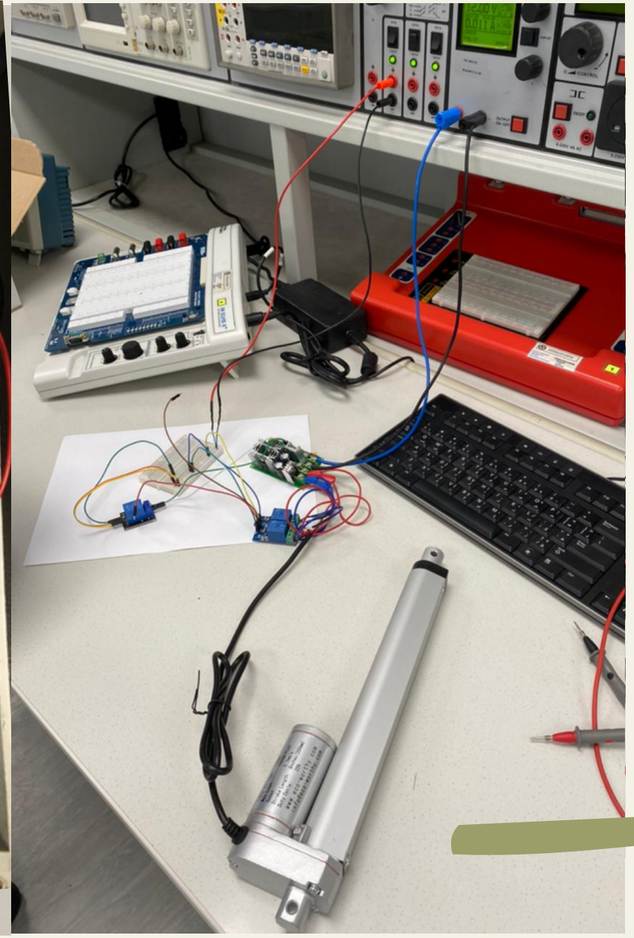
Design: Testing

Subsystem 2: Smart Stand (Stand Movement)

Design: Testing

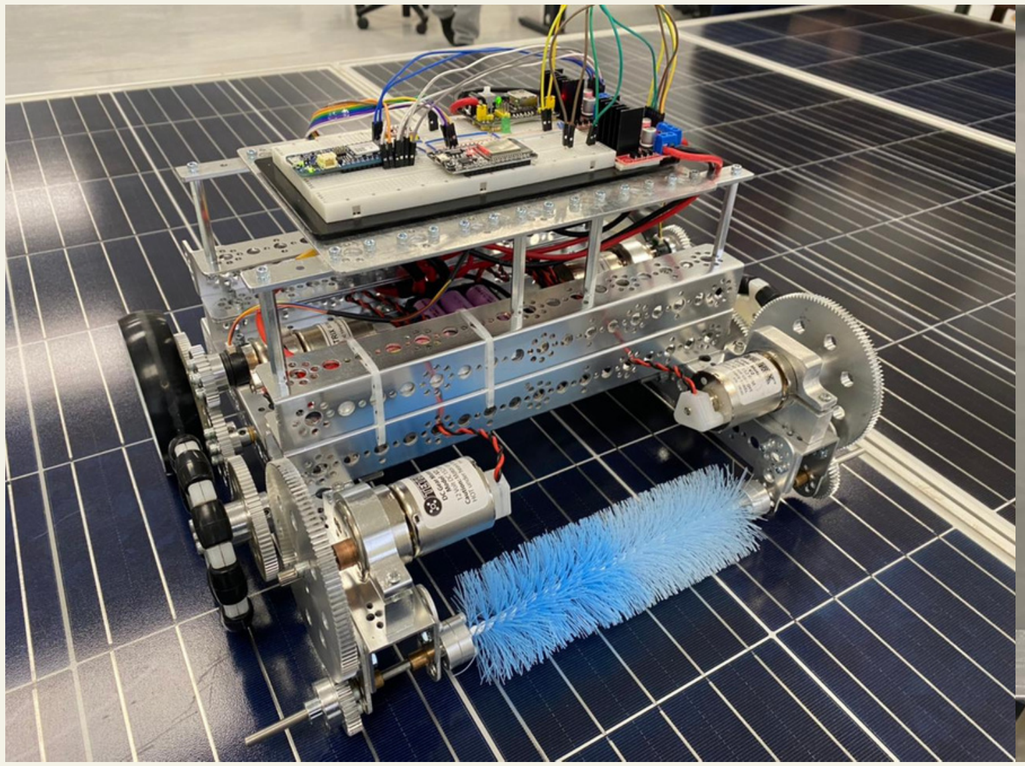
Subsystem 2: Linear Actuator (Stand Movement)

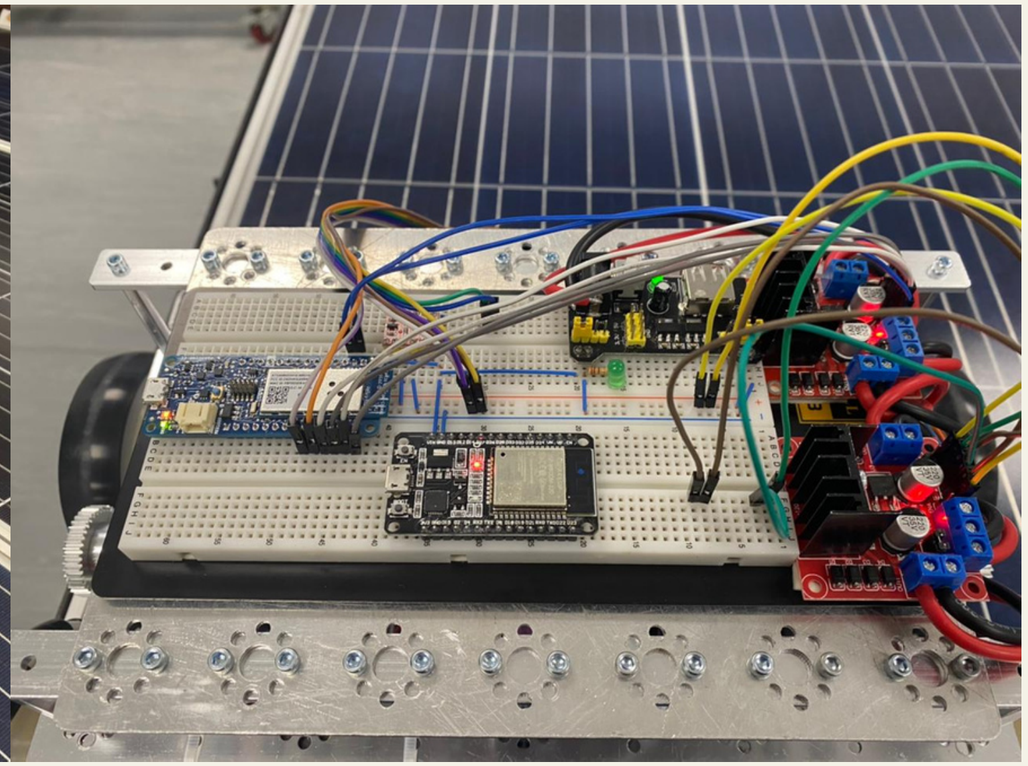




Design: Testing

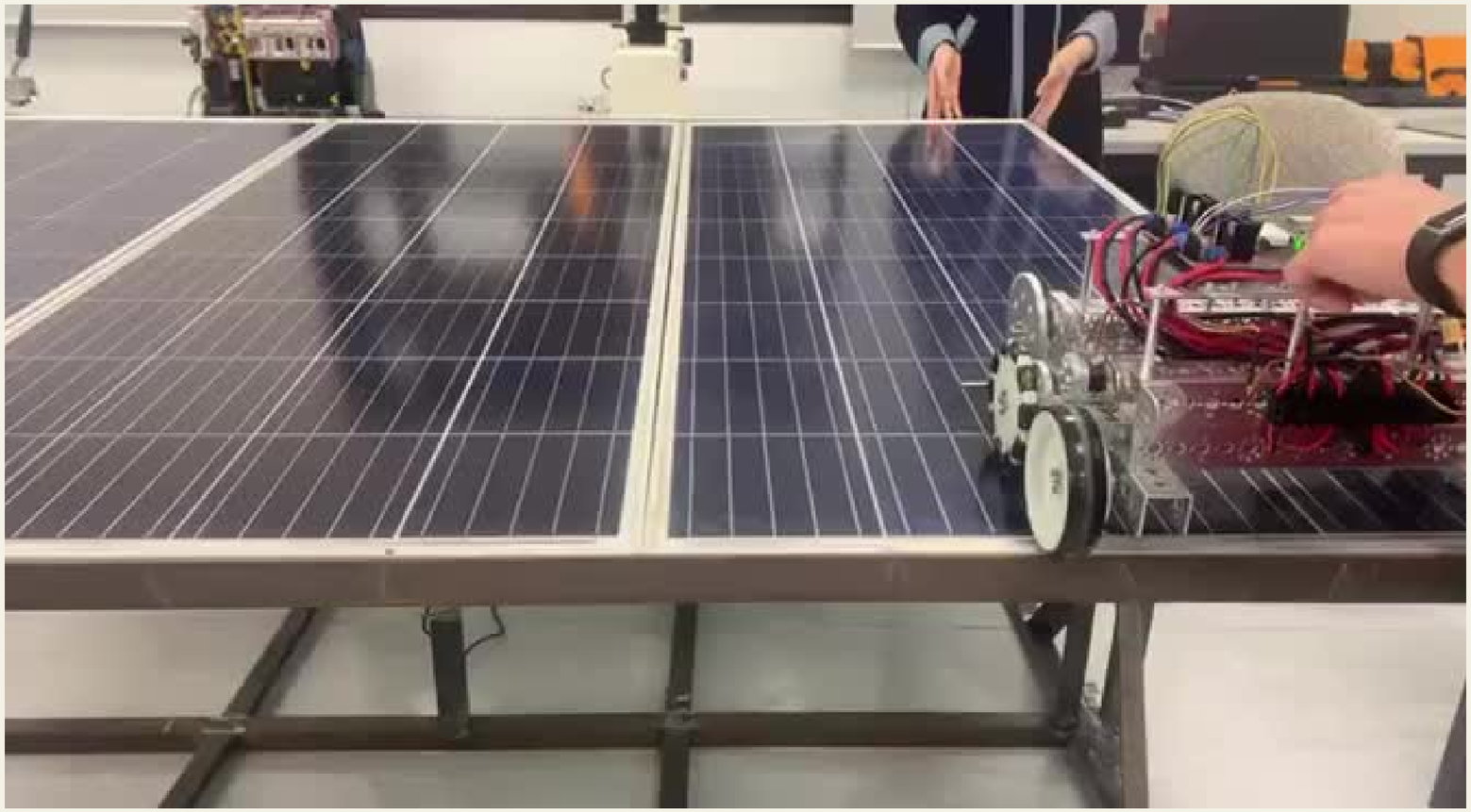
Subsystem 3: Cleaning Robot



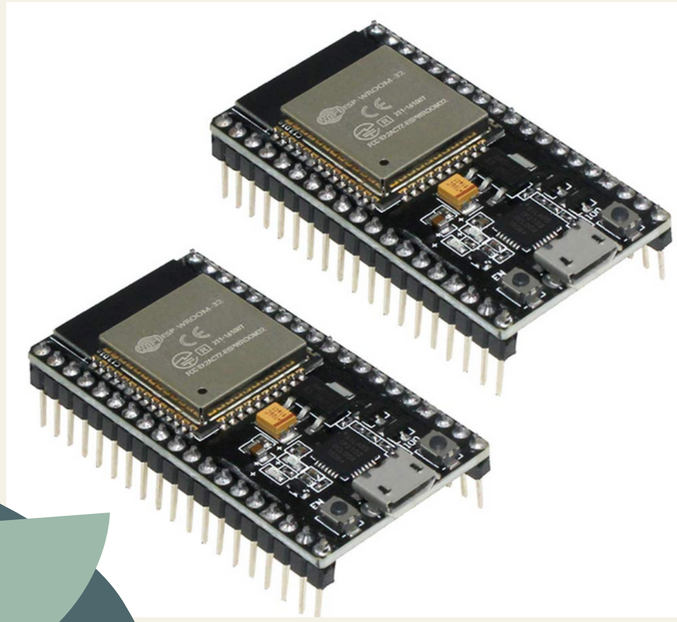


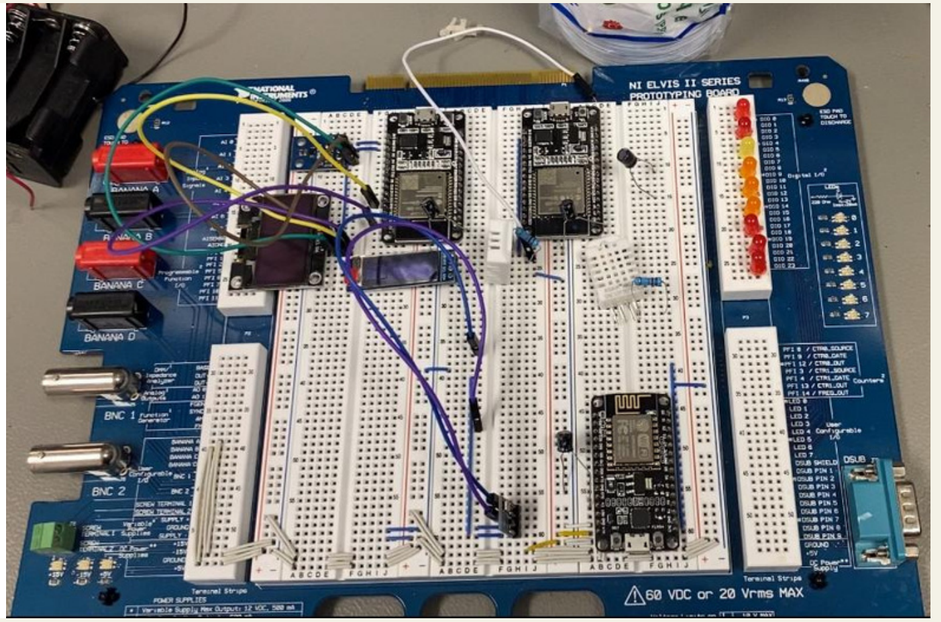
Design: Testing

Subsystem 3: Cleaning Robot



Design: Integration of 3 Subsystem





Design: Integration of 3 Subsystem

Installation of SAFETY controls for the system

Project Management & Team Work

Risk Assessments and Challenges

- Access to the campus
- Finding the perfect place to install the solar panels system.
- Availability of components.
- Designing & building the solar stand.
- The robotic car movement.
- The project deadline has been moved on an earlier date.
- Coding difficulties during system hardware and software integration

Project Management & Team Work of Project

COVID-19 Impact

- We weren't able to have meetings outside the university
- Since movements are restricted, canvasing of parts from local stores were backslashed which significantly lengthen the acquisition of system parts
- The delivery of electronic and mechanical components were delayed and stuck in customs
- Covid-19 created a barrier to consult PMU faculty in several concerns
- Psychologically since the virus outbreak, working together effectively has been dramatically affected by the term social distancing.

Project Management & Team Work

The taem has contributed and acquired several skills such as

- Design and implement hardware circuit to satisfy a component.
- Arduino to design software that engages multiple sensors.
- Calibrating sensors to obtain accurate outputs.
- Mechanical design and construction involving electronic parts (mechatronics).
- modifying hardware to meet a library code specifications.
- Integrating subsystems to IoT.

Budget Estimation

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
1	Arduino-mega controller	1	20	20
2	DC Motor	4	15	60
3	Current sensor	3	55	165
4	SD card (8gb-16gb)	2	28	56

Budget Estimation

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
5	Relay Module	2	4	8
7	Robot body & wheels	1	100	100
8	Raspberry pi	1	300	300
9	Solar designed stand	1	600	600

Budget Estimation

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
10	Controlling tool	1	200	200
11	Li-Ion battery	1	60	60
12	Cleaning Brush	2	15	30
13	DCT DS3231	1	10	10

Budget Estimation

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
14	Voltage sensor	3	20	60
15	TF card memory shield	1	10	10
16	LCD 16x2	1	45	45
17	12-24 DC lamp	1	15	15
Totals				**1418**

Conclusion

Our solar cleaning system is automatic, independent, and enhances the harvesting of solar energy usage among local utilities. which is to promote the sustainable life living and attract more people or households to switch if not to integrate solar energy plant to their homes.

Engineers are the builders of the nation.

Any Questions?