Prince Mohammad University
Department of Electrical Engineering

Smart Cleaner

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Advisor: Dr. Samir El-Nakla

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Outline

- Project definition
- Project Objectives
- Project Specifications
- Project Architecture
- Planning
- Background & Previous Projects
- Design: Subsystems and Component Selection
- Testing
- Project Management & Team Work
- Completed and Remaining Work
- Budget Cost
- References

Project Definition

To design a smart vacuum that can automatically clean the floor. It can also be controlled remotely and can clean different type of floors.

Project Objectives

i. Can be used on your setting time.

ii. Increase cleaning efficiency.

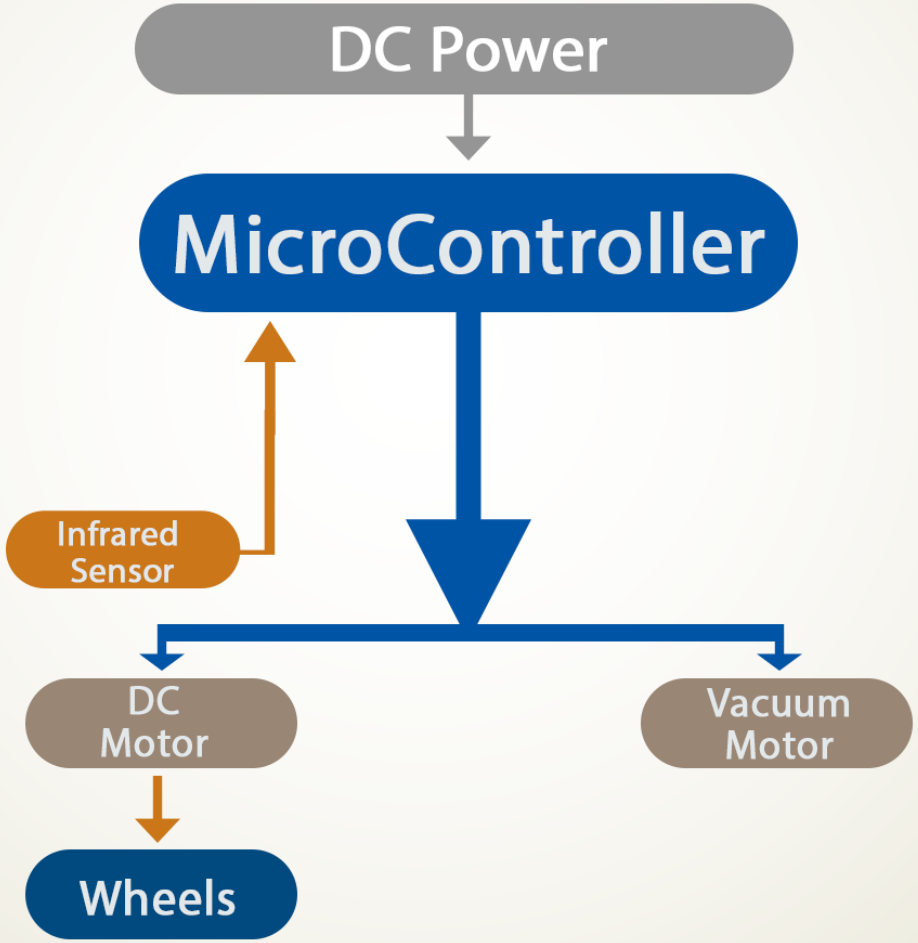
iii. Help old people and people with special needs.

iv. Easy to use.

Project Specifications

1. Can clean different types of floor within 2 cm maximum height.
2. Can be controlled remotely with range 30 m in free space.
3. Return to home charging station.
4. The dimensions 21x21 cm, and the height is 7.6 cm.
5. Charging time around one hour.
6. Operation time around 15min.

Project Architecture



Planning

- Verify project feasibility.
- Check the all components, where some of them are here in the local market, and others from abroad.
- The testing can be done in PMU labs.

Background: Problem

- Old people and people with special needs have problems with cleaning the floor.
- You can only clean manually in traditional vacuum.
- Existing vacuum cleaners take more space.

Background: Solutions

- Robot cleaner can be used easily with the old people and people with special needs.
- Robot cleaner will save power more than the traditional machine.
- Robot cleaner can be work in different modes.
- Robot cleaner does not take space.

Previous Projects (1)

Hamdard University, Pakistan

- Vacuum Cleaner.
- LCD.

Previous Projects (2)

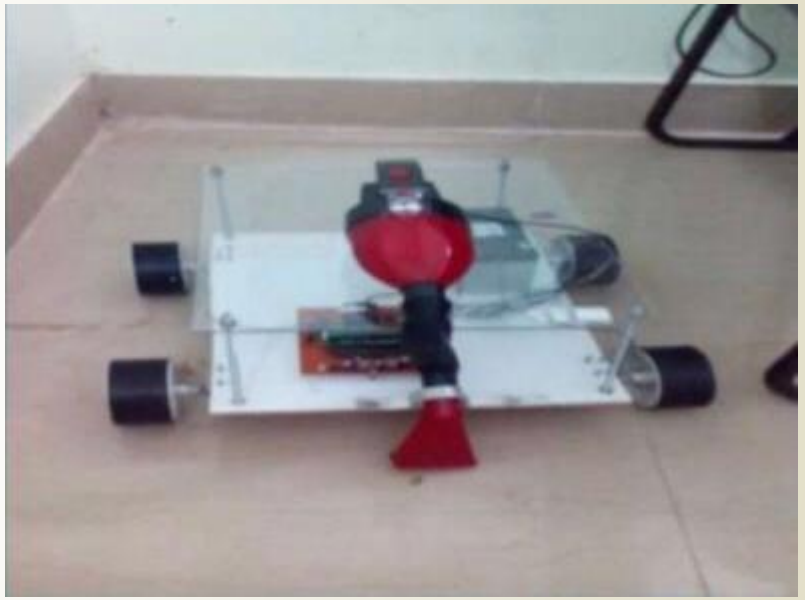
SRM University - India

- Vacuum Cleaner.
- Not remotely controlled.

Previous Projects (3)

GIFT University - Pakistan

- Vacuum Cleaner.
- Manual Control.



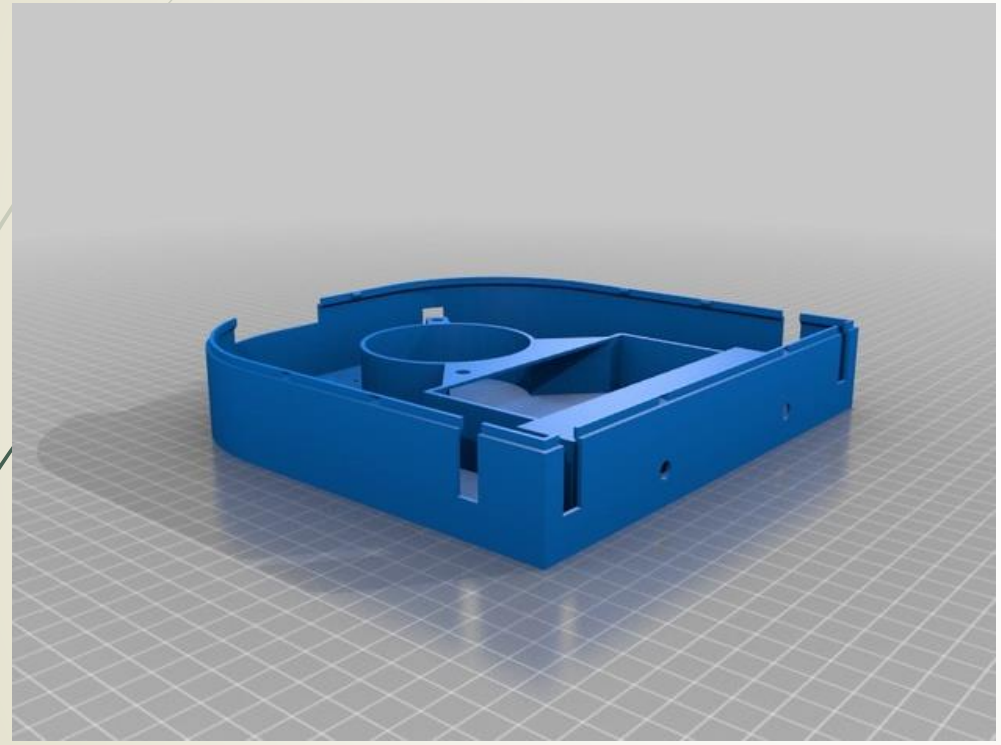
Previous Projects Summary

Projects	1	2	3	Our Project	Projects
Vacuum	√	√	√	√	Vacuum
Remote control	√		√	√	Remote Control
Communication				√	Communication
Home Charger				√	Home Charger

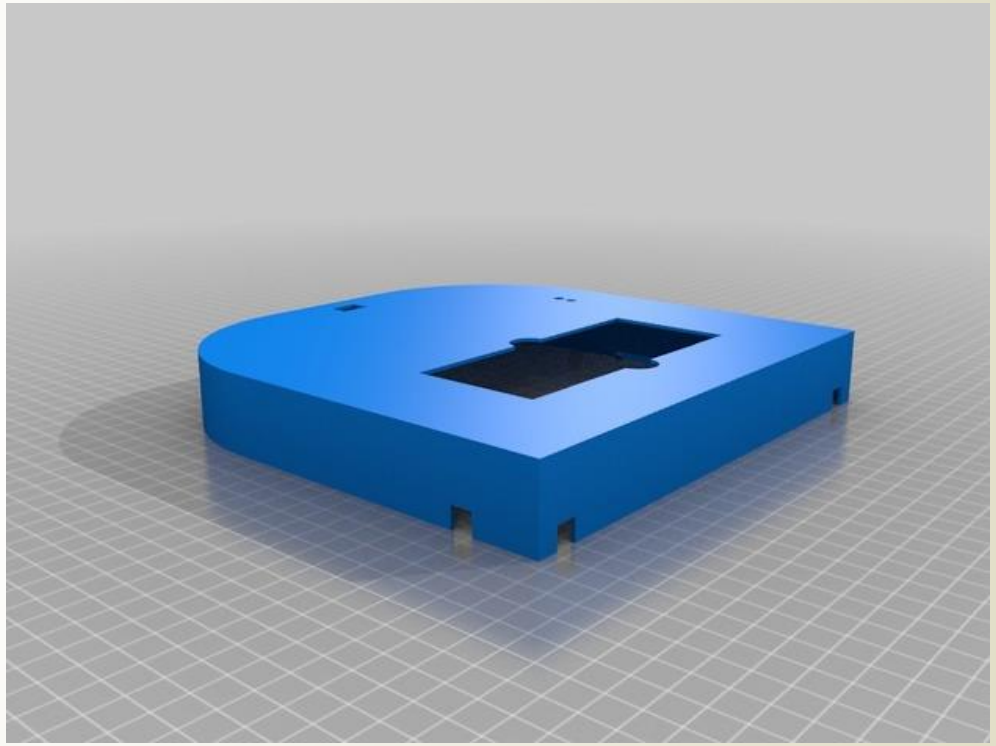
Design: Structure Options

3D Printer	Acrylic Laser Cutting Machine
Cheaper	Cheaper
Stronger	Not strong

Design: Sub System 1 (chassis design)

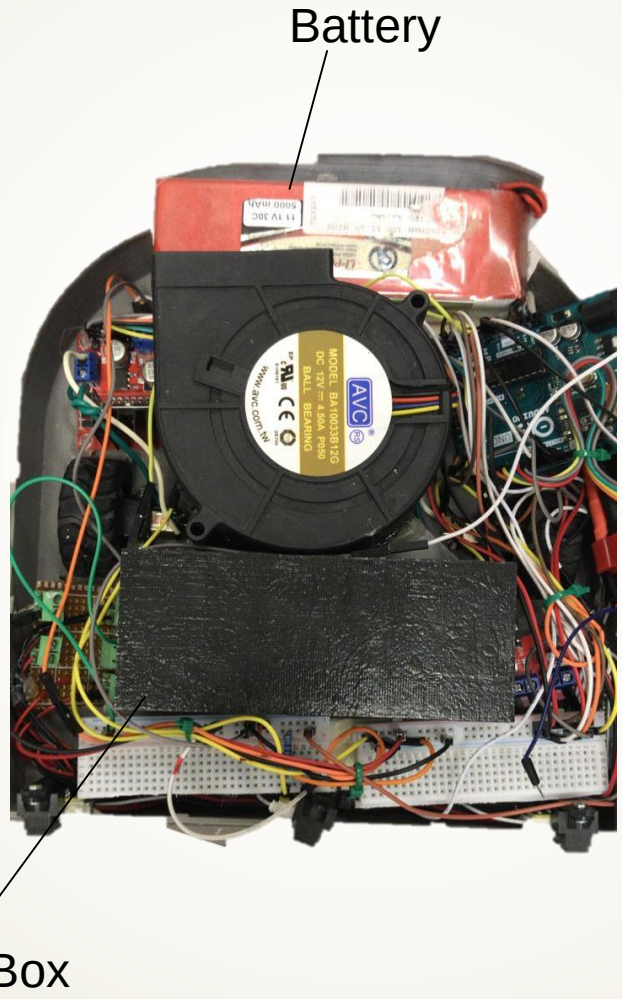


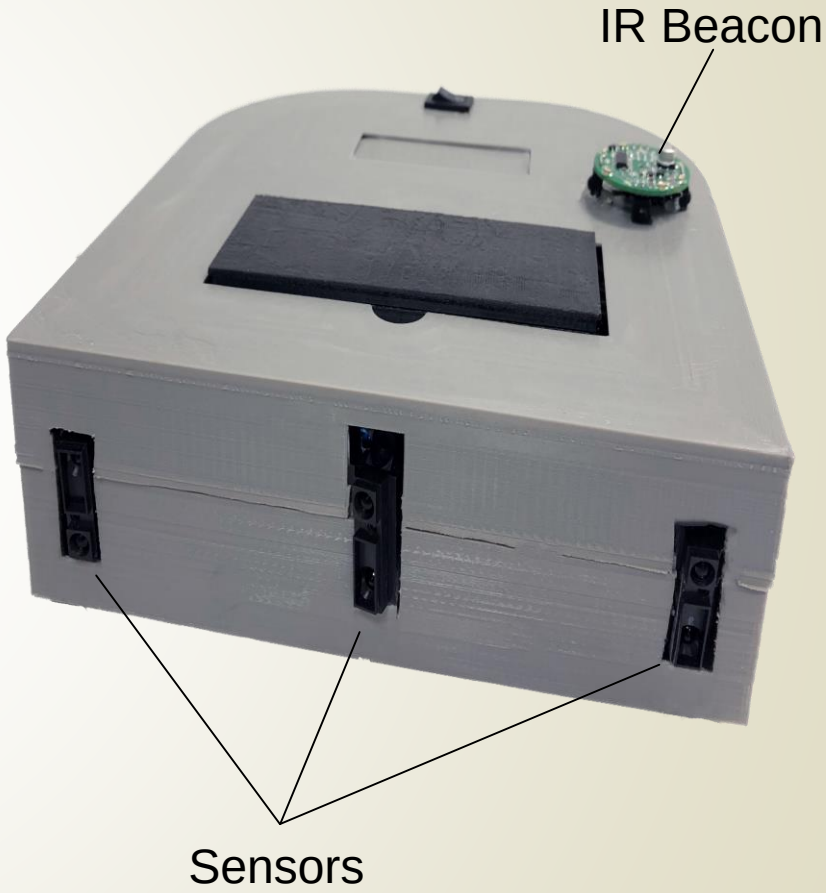
The Components Place



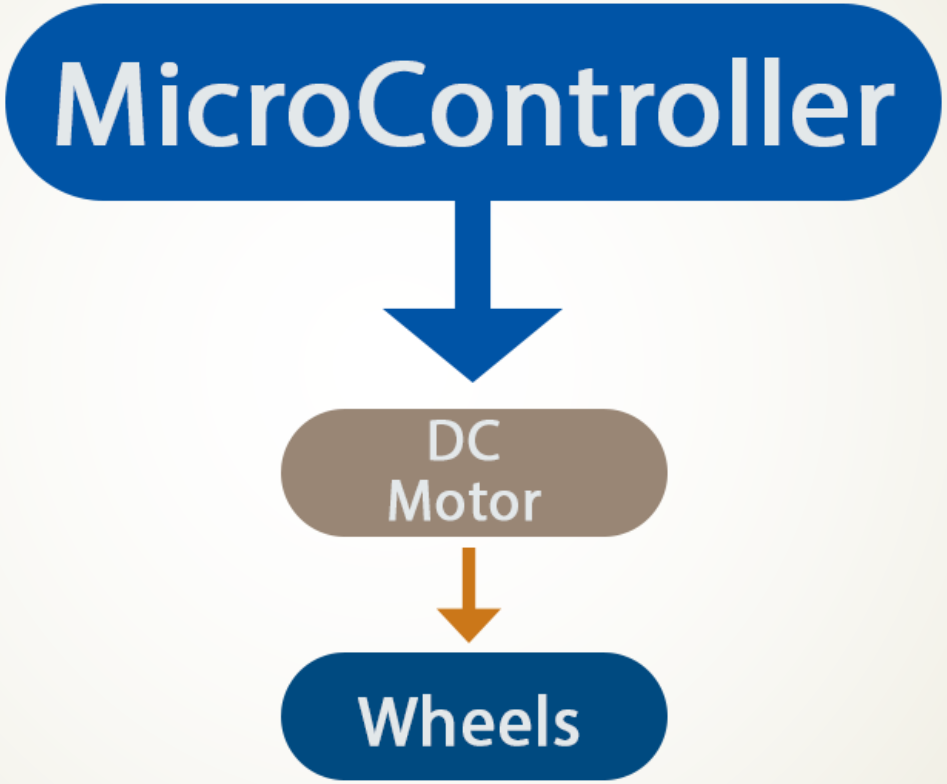
Top Cover

Chassis After Printing





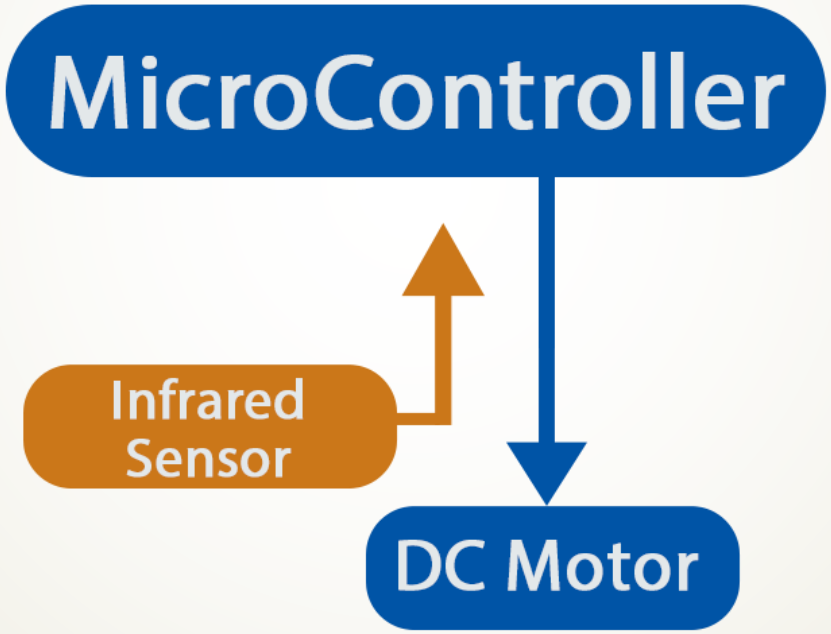
Design: Subsystem 2 (DC Motor)



Design: Motor Options

DC Motor	Servo Motor
Smaller	Smaller
Rotate Freely	Limited rotate 180°

Design: Sub System 3 (Auto-Mode)



Sharp Analog Distance Sensor 4-30 cm

Device Specification:

- **Operating voltage:** 4.5 V to 5.5 V
- **Output type:** analog voltage
- **Size:** 44.5 mm × 18.9 mm × 13.5 mm (1.75″ × 0.75″ × 0.53″)
- **Weight:** 3.5 g (0.12 oz)

Pololu IR Beacon Transceiver

Device Specifications:

- **IR modulation frequency:** 56 kHz
- **Detection range:** 15 cm to ~450 cm(typical; actual max range will depend on ambient lighting conditions)
- **Supply voltage:** 6-16 V
- **Number of IR detectors:** 4

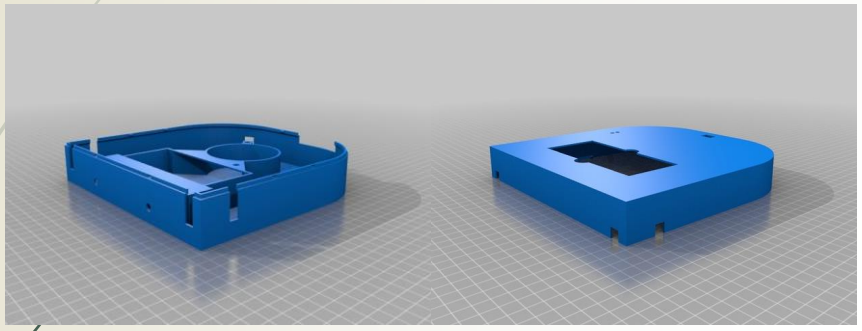
Line follower sensor IR

Device Specifications:

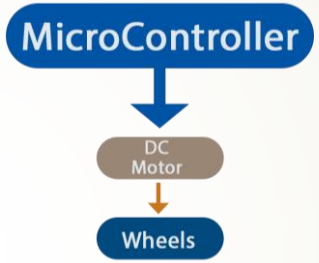
- **Voltage:** 3.3 V to 5 V
- **Working current:** ≥ 20 mA
- **Size:** 42 mm x 11 mm x 12mm

Design: Completed Work

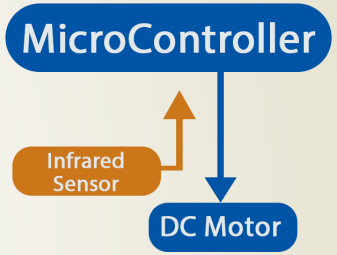
- **In this semester we finished with three subsystems approx. 100%**



Subsystem 1 (chassis design)



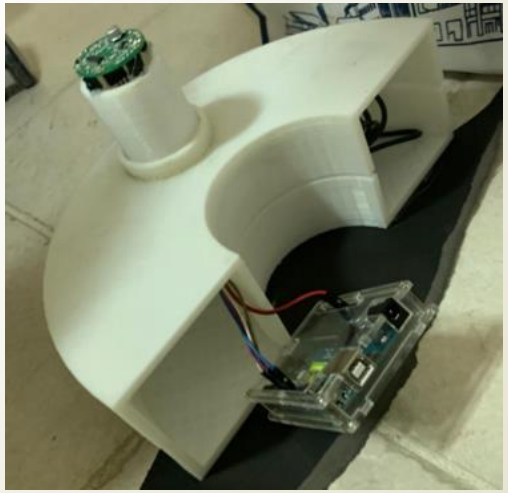
Subsystem 2 (DC Motor)



Subsystem 3 (Auto-Mode)

Completed:

- Chassis Design.
- DC Motor.
- Auto-Mode.
- Return To Home Base



Home Base

Design: Remaining Work

- **The remaining works are:**

All subsystems have been implemented successfully.

Project Management & Team Work

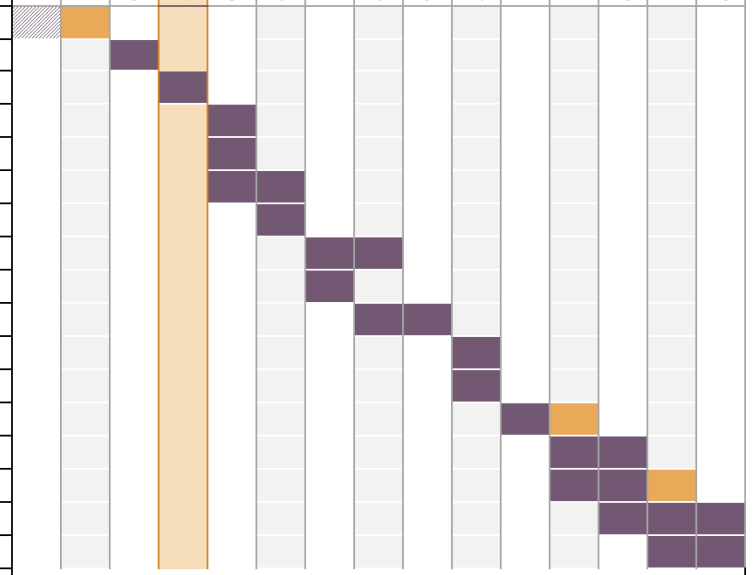
Last updated on 20st of November

Title: Smart Cleaner	Advisor: Dr. Samir El-Nakla	Design II (ASSE 3)	Fall 2019
Hussain AlYami 201301015		Project PLAN & Progress	
Falah Almutairi 201301166		ProgRpt No. 5	
Turky Alkhamis 201301566		Plan updated (Date): November 20 2019	
Ibrahim Almarzouk 201403781		Instructor: Dr. Sadiq Alhuwaidi	

Period Highlight: 4 — Plan — Actual — Actual (beyond plan) — % Complete (beyond plan)

ACTIVITY	PLAN START	PLAN DURATION	Assigned To	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Write a plan for the Fall smester	1	1	ALL	2	1	100%
Ordered the components (sensors)	3	1	ALL	3	1	100%
visit the 3D printing store (to print second floor)	4	1	Hussain	4	1	100%
Meeting with the advisor	5	1	All	5	1	100%
Build the First Phase (connect the sensors)	5	1	All	5	1	100%
Write the code for the robot with the sensor	5	2	All	5	2	100%
test the code with the sensor	6	1	All	6	1	100%
design the home charge	7	2	All	7	2	100%
Prepare midterm presentation	7	1	All	7	1	100%
Design subsystem 3 (with the vacuum motor)	8	2	All	8	2	100%
write the code for the vacuum motor	10	1	All	10	1	100%
Test subsystem 3	10	1	All	10	1	100%
Test everything, and test the home charge	11	1	All	11	2	100%
Prepapre final report	12	2	All	12	2	100%
Prepapre final presentation	12	2	All	12	3	100%
Prepare project demo	13	3	All	13	3	100%
Submit Rpt/PPT/Brochure	14	2	All	14	2	100%

Periods (Weeks 1-15): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15



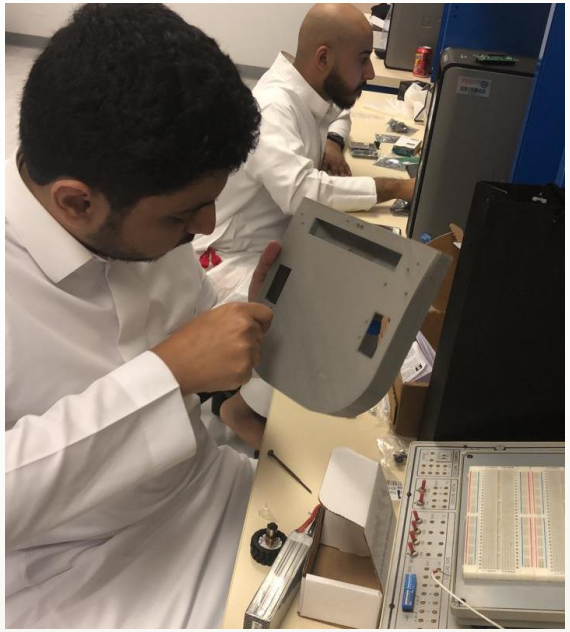
Progress Details:	Issues (delay ...):

Project Management & Team Work

- Team work task division

Task	Hussain	Falah	Turki	Ibrahim
Search & acquire components	30%	30%	30%	10%
Design & Implement Subsystem 1	40%	20%	20%	20%
Design & Implement Subsystem 2	20%	35%	35%	10%
Design & Implement Subsystem 3	25%	25%	25%	25%
Design & Implement Subsystem 4	25%	25%	25%	25%
Write Reports & Presentations	25%	25%	25%	25%

Project Management &Team Work



Project Management & Team Work

The Challenge:

- **The challenge is finding the exact battery.**
- **Also, the challenge is to build the Charge for our vacuum.**
- **finding the appropriate location to clean, when to stop cleaning, delay problem you faced.**

Budget Cost

Item	Quantity	Unit Cost (SR)	Subtotal
Microcontroller	1	179.55	179.55
Wheels With Motors	4	125	500
3D Printer Chassis	1	1200	1200
Components	-	725	725
Total			2604.55 SR

References

- https://www.kiriazi-maintenance.com
- http://www.gift.edu.pk/home
- http://www.srmuniv.ac.in/
- https://www.youtube.com/watch?v=oIKSulS9MaE
- https://www.slideshare.net/AsishNayak1/wireless-floor-cleaning-robot
- http://www.standardsuniversity.org/wp-content/uploads/Smart-Floor-Cleaning-Robot-CLEAR.pdf
- http://www.hamdard.edu.pk/