



Prince Mohammed bin Fahad University
Electrical Engineering Department
Security Robotic Car

	Student Name	Student ID
1	Mansour Allowais	201501084
2	Ali Al Shamrani	201600648
3	Mohammed Al Ghamdi	201600645

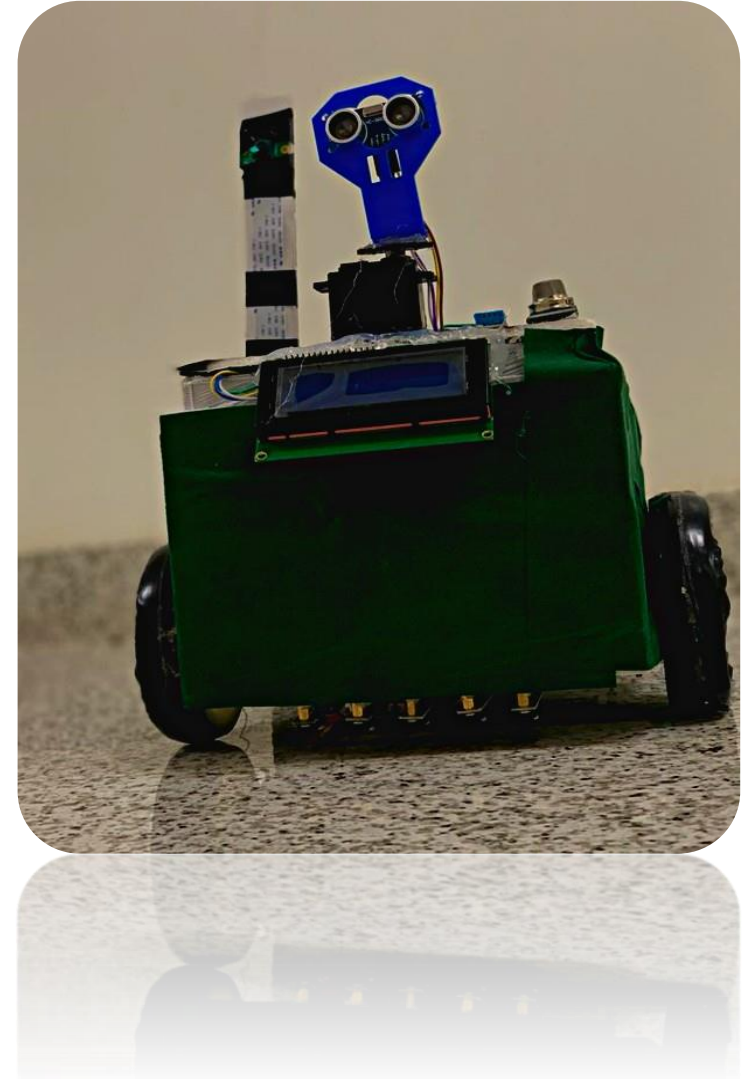
Project Advisor: Mr. Saifullah Shafiq
May 17th, 2022

Outline

- Project definition
- Project Objectives
- Project Specifications
- Project Constraints and Engineering Standards
- Project Architecture
- Planning
- Background & Previous Projects
- Design: Subsystems and Component Selection
- Testing
- Project Management & Team Work
- Impact of Project
- New Skills Acquired and Applied
- Completed and Remaining Work
- Budget estimate
- References

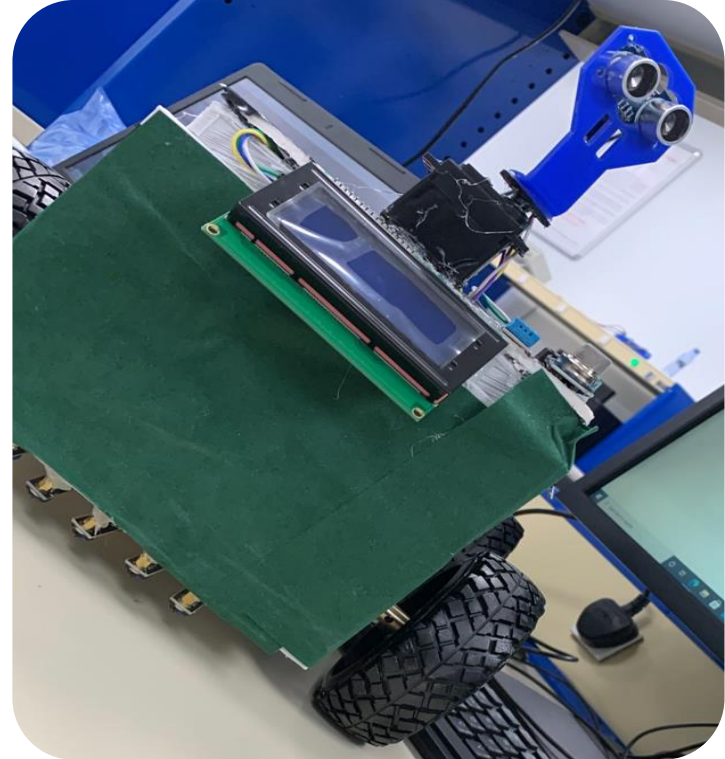
Project Definition

Security robotic car that has two main application. First application is to be at facilities entrances to recognize faces and capable of reading the QR code in “Tawakalna” to verify a person’s health status. The second application is to patrol inside restricted areas.



Project Objectives

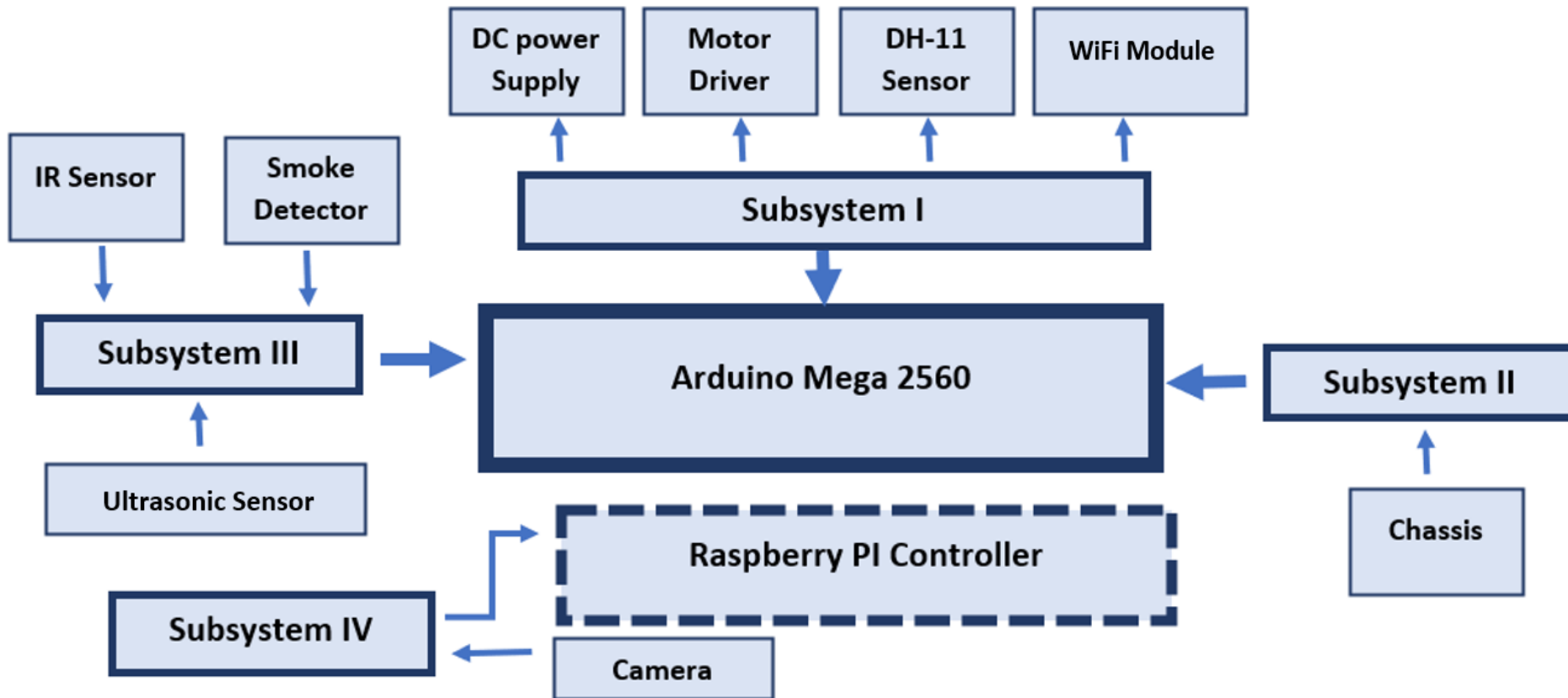
- Enhancing facility's security.
- Minimizing the risk of spreading the infection.
- Improving restricted area's security & safety.



Project Specifications

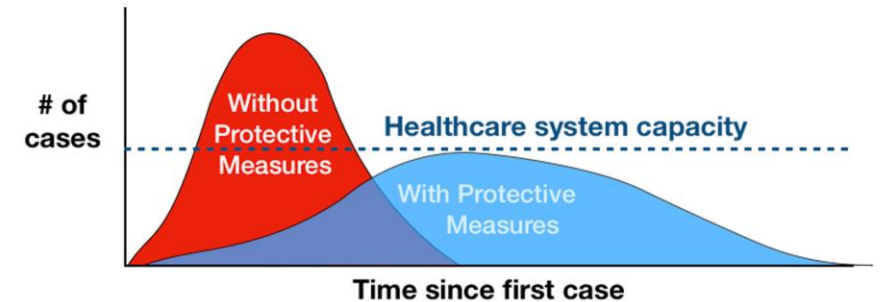
- It detects human through camera face recognition.
- It follows a black line to act as a patrolling car.
- It avoids obstacles using Ultrasonic Sensor.
- It can operate for a minimum of 30 minutes duration.
- Reads QR-code in TAWAKLNA application.
- Detects smoke and release an alarm.
- Detect temperature and humidity.

Project Architecture



Background

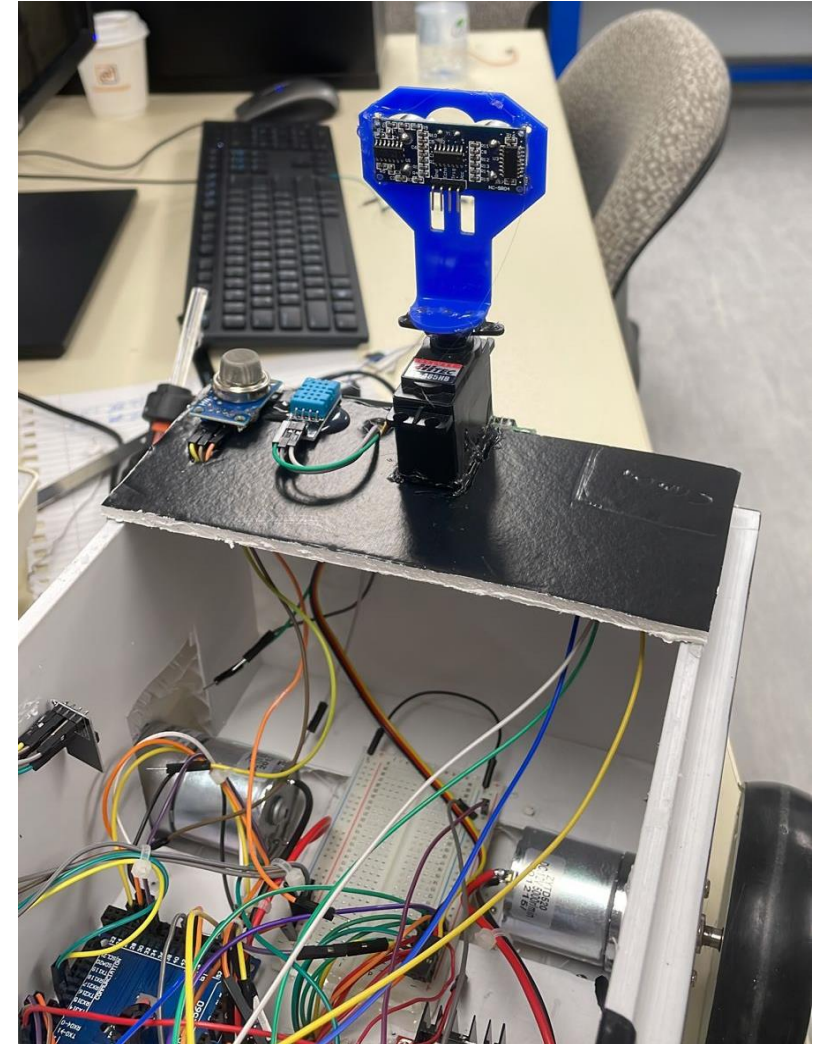
- In these days mankind should not let their guards down to the pandemic.
- In cases of injuries, some occur in restricted areas that aren't fully monitored or supervised.
- Many human interaction with gate's securities is a one of the potentials to spread any virus.



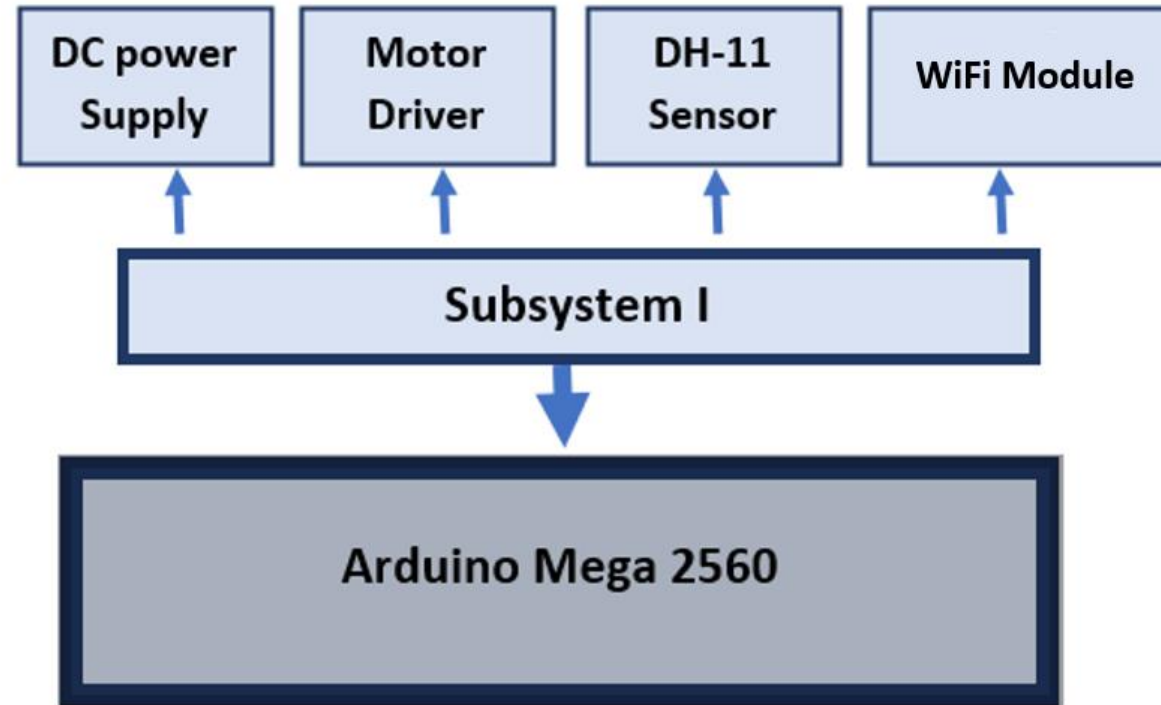
Adapted from CDC / The Economist

Planning

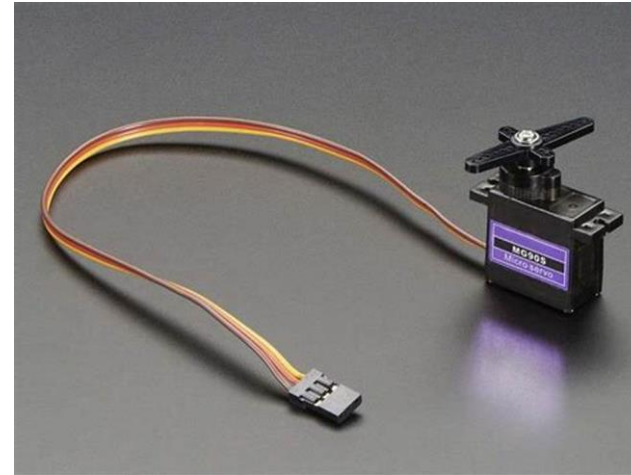
- The project was feasible.
- All components were available in local market.
- The chassis subsystem was built using 3-D printing technology.
- Testing was done inside & outside PMU, didn't need special equipments.



Design: Subsystem I



Design Structure: Motors Selection



High Power Low Noise DC Motor	Servo Motor
High Torque	Medium torque
Cheaper and available	Affordable
Medium	Small

Design Structure : Chassis



3D printing



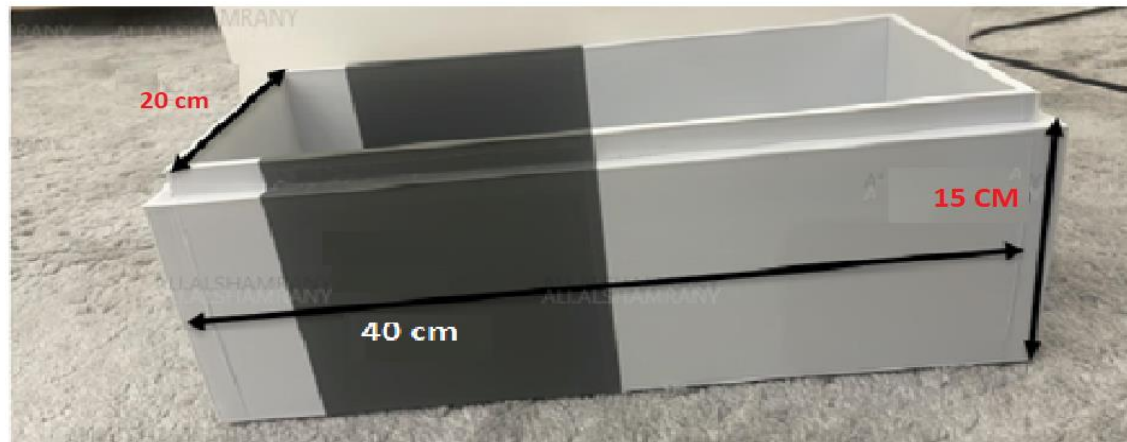
Metallic chassis



Wooden chassis

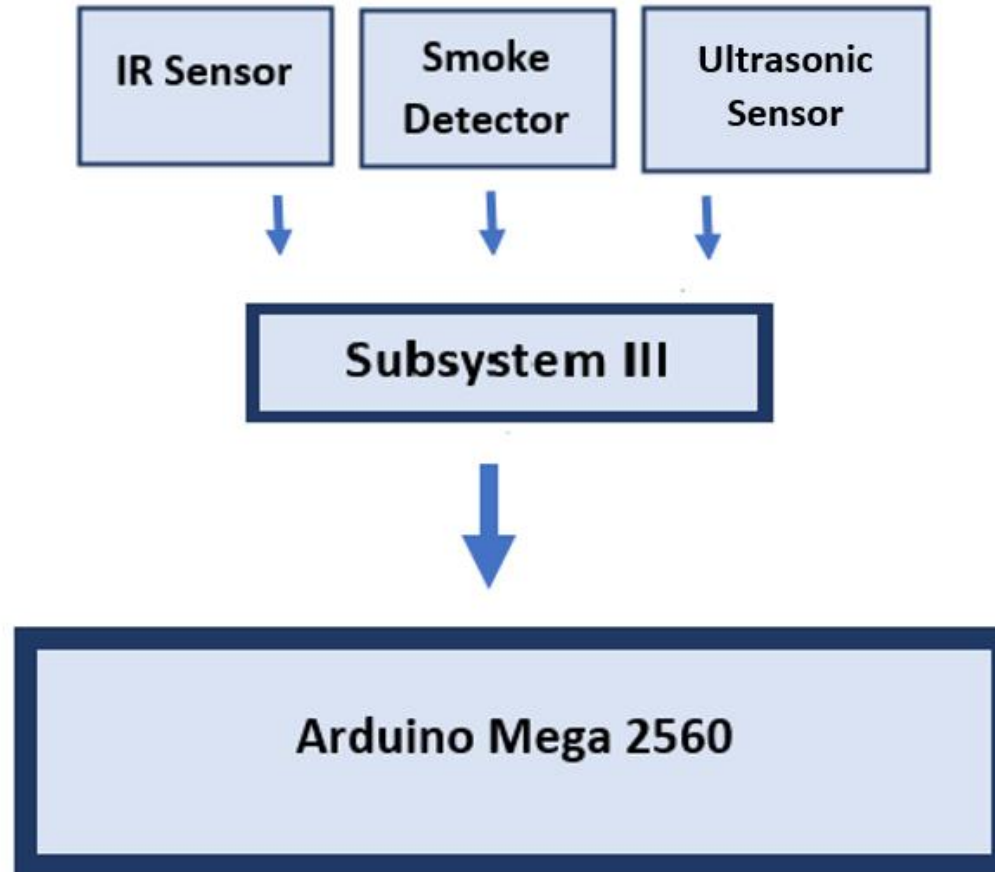
Subsystem II

- Chassis had been printed using a 3D printer in three pieces linked together by using a special glue.
- Chassis' weight is around 700 gm.
- Chassis dimensions are:
 - Length = 40 cm.
 - Height = 15 cm.
 - Width = 20 cm.



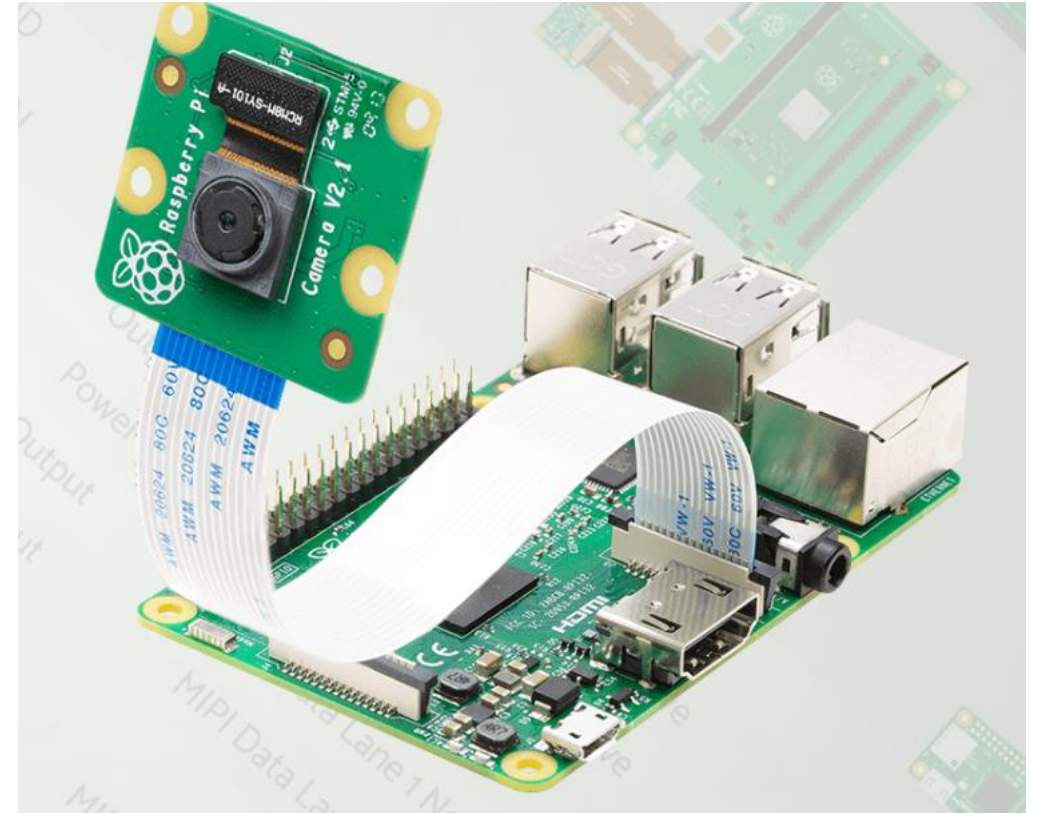
Weight \approx 700gm

Subsystem III Architecture

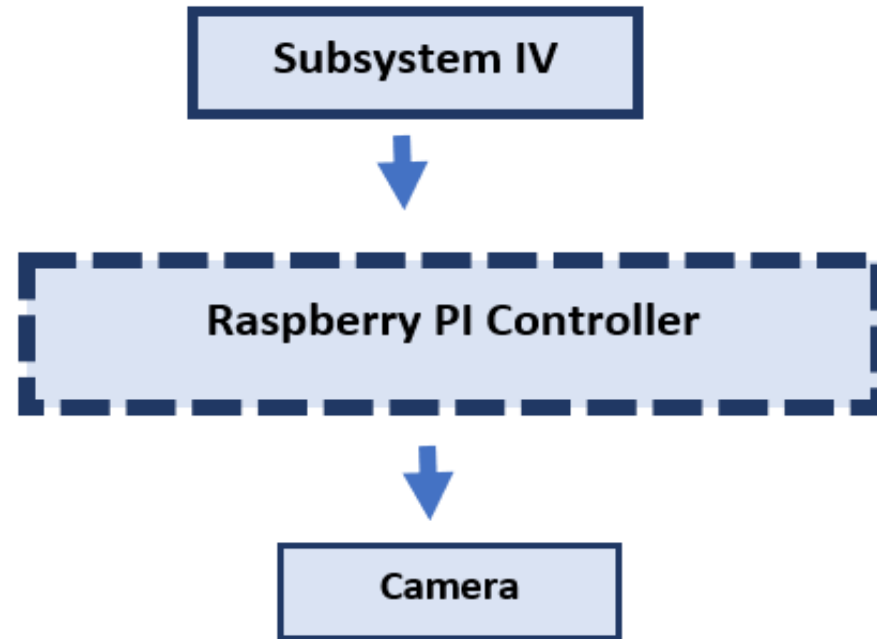


Subsystem IV

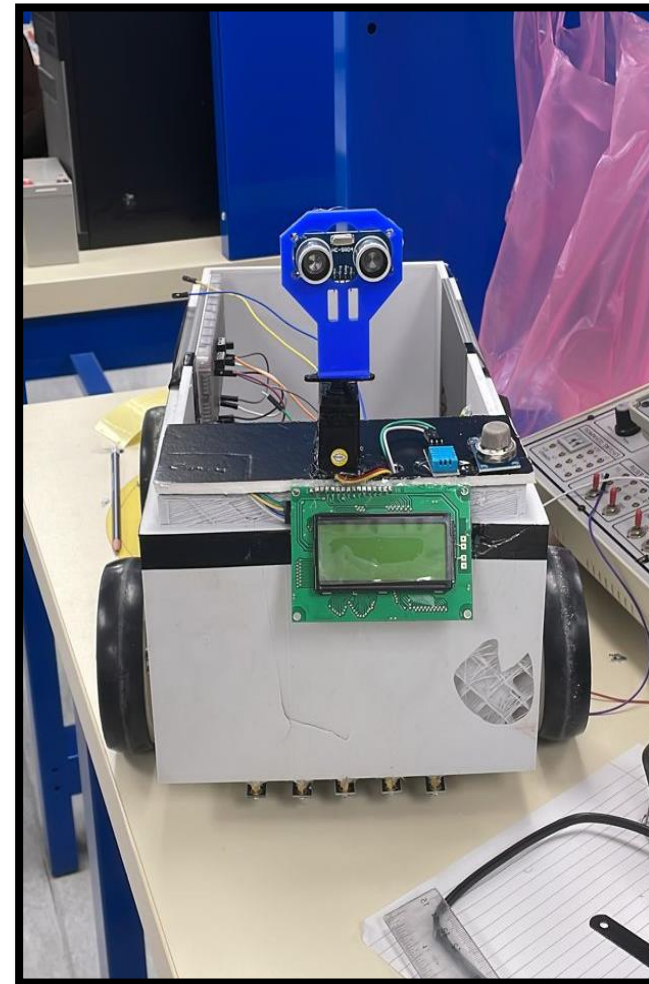
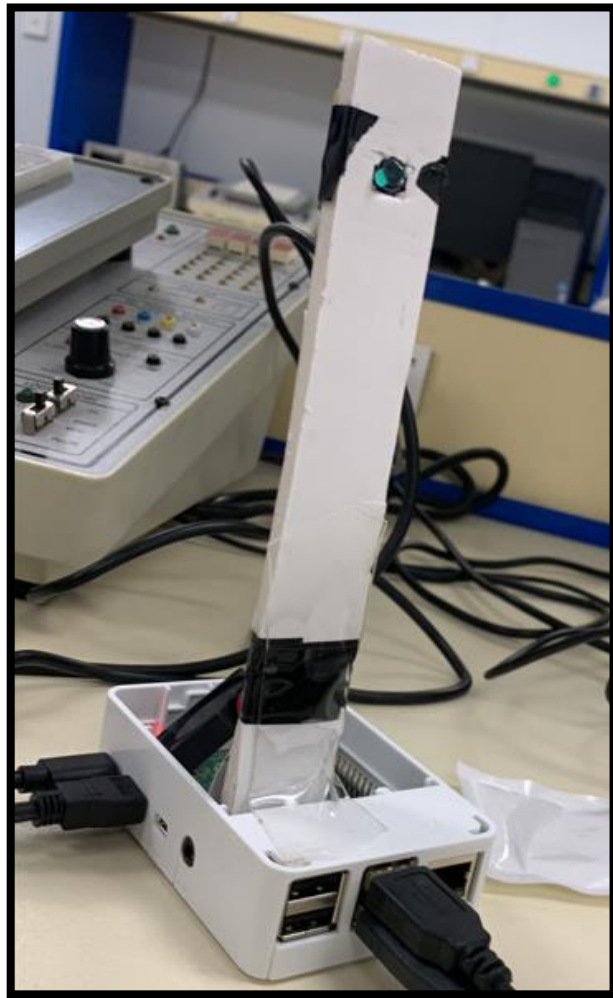
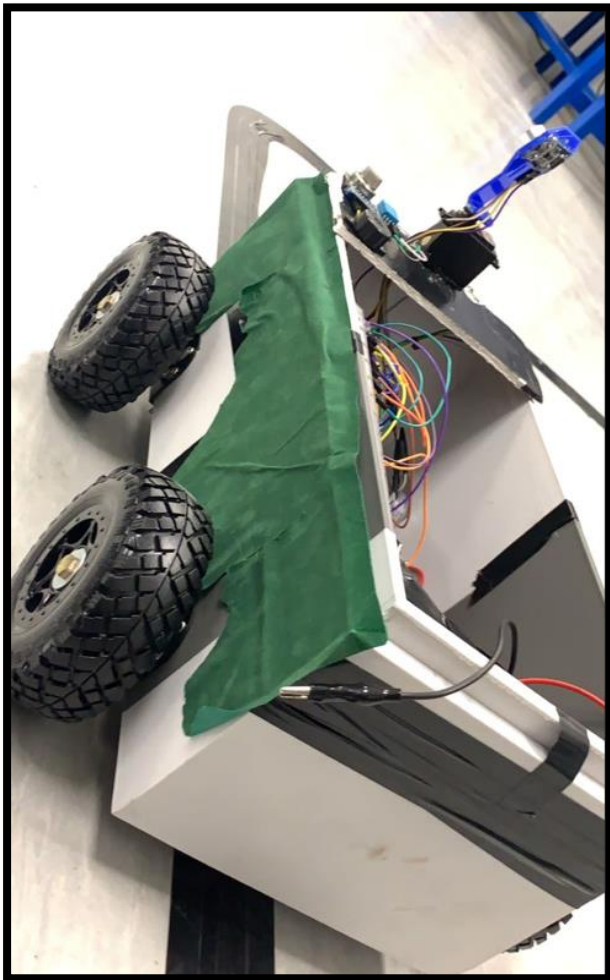
- This sub-system is Raspberry pi along with a Raspberry Pi camera.
- The camera can recognize faces and reads QR codes.
- Programmed with Python language to satisfy the robot functionality.



Subsystem IV Architecture



Testing



Design: Completed Work

- Subsystem I is 100% completed.
- Subsystem II is 100% completed.
- Subsystem III is 100% completed.
- Subsystem IV is 100% completed.

Project Management & Teamwork

Title: Security Robotic Car		Advisor: Dr. Saifullah Shafiq					Design II (ASSE 3)			Spring 2022											
Mansour Alowais (MO) 201501084							Project PLAN & Progress														
Mohammed Alghamdi (MG) 201600645							ProgRpt No. 4														
Ali Alsharnai (AS) 201600648							Plan updated (Date): May,16, 2022														
ACTIVITY	PLAN	PLAN	Assigned	ACTUAL	ACTUAL	PERCENT	% Complete (beyond plan)														
	START	DURATION	To	START	DURATION	COMPLETE	Periods (Weeks 1-15)														
Write a plan	1	1	ALL	2	2	100%	1	3	4	5	6	7	8	9	10	11	12	13	14	15	
Design subsystem I: power supply, motor driver, sensors.	2	1	MG, AS	2	2	100%															
DC Motors installation	5	2	MG, MO, AS	7	3	100%															
Wheels instillation	4	3	MG, MO, AS	8	2	100%															
Test subsystem I: power supply, motor driver, sensors.	3	1	ALL	3	2	100%															
Connecting & programming Motor driver (H-Bridge)	4	1	ALL	6	6	100%															
Calibrating DH-11 (coding)	3	2	MO, AS	3	3	100%															
Programming Ultrasonic sensor	3	3	MG, AS	3	3	100%															
Chassee subsystem (subsystem II)	2	3	MG, AS	2	2	100%															
Installing the spare parts into the chassi	3	6	ALL		5	100%															
Determining Ultrasonic sensor distance (coding)	2	4	ALL	3	3	100%															
Implementing subsystem III: Obstacle avoidance, sensors.	6	5	MG, AS		5	100%															
Implementing the code for Line follower	7	9	MO, MG,	8		100%															
Implimenting the code for Lane finder	7	10	MO, MG, AS	8		100%															
Connecting & programming IR sensors	7	8	MG, AS		8	100%															
Implemnting subsystem IV: Camera system, QR code reader.	5	3	MO, MG,		3	100%															
Camera code for streaming	5	4	MG, MO	4	4	100%															
Camera code for face recognition	4	6	MG	5	4	100%															
Programming camera to read QR- Codes	5	3	ALL	4	6	100%															
Prepare midterm presentation and video	9	2	ALL	7	2	100%															
Implement industrial design	7	4	ALL	4		100%															
Prepape final report	12	2	MO, AS		2	100%															
Prepape final presentation	12	2	ALL		3	100%															
Prepare project demo	13	3	ALL		3	100%															
Submit Rpt/PPT/Brochure/Video...etc.	14	2	ALL	9	2	100%															

Progress Details:	Issues (delay, etc.):
Installing the Open CV file is completed	
All the parts had been installed and glued to the chassi (Motors, Battery, Microcontrollers)	
Using the openCV file to read QR code is completed	
All the sensors are functioning as expected	

Project Management & Teamwork

Task	Ali	Mohammed	Mansour
Search & acquire components	30%	40%	30%
Design & implement Subsystem 1	40%	30%	30%
Design & implement Subsystem 2	60%	20%	20%
Design & implement Subsystem 3	30%	30%	40%
Design & implement Subsystem 4	20%	60%	20%
Testing	30%	40%	30%
Write Reports & Presentations	20%	20%	60%

Project Management & Teamwork

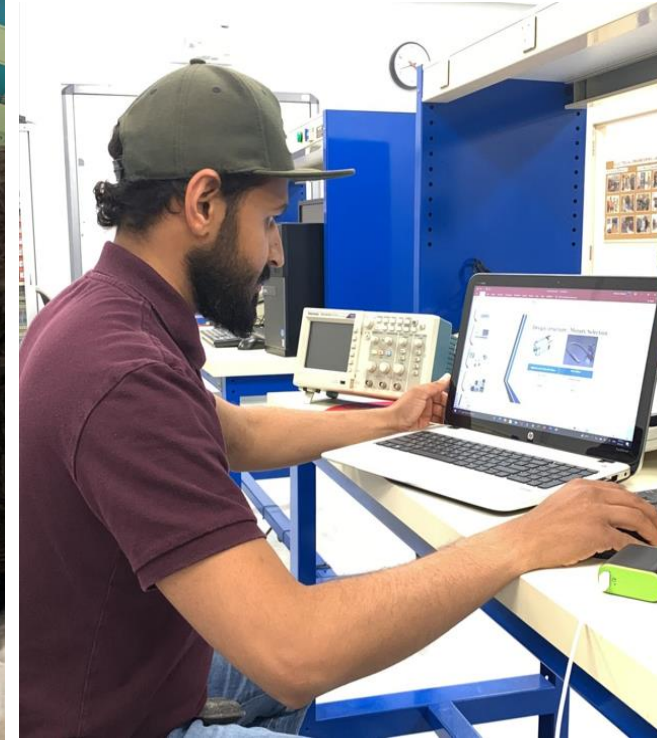
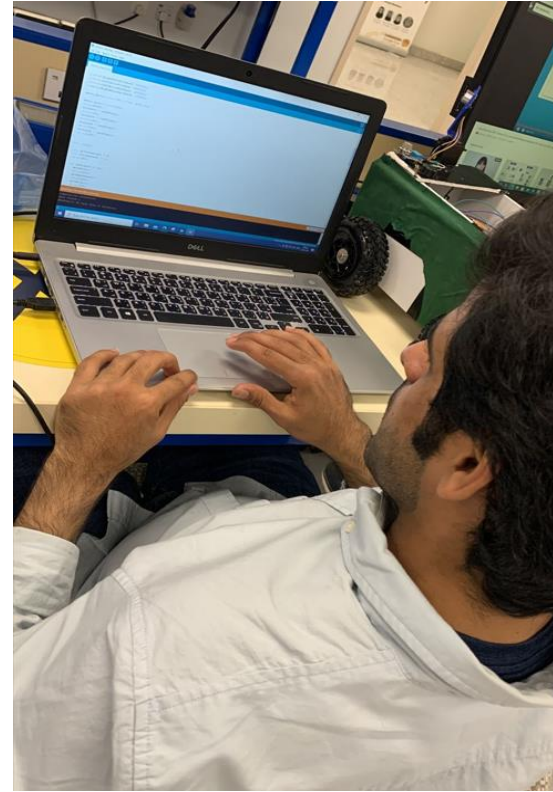
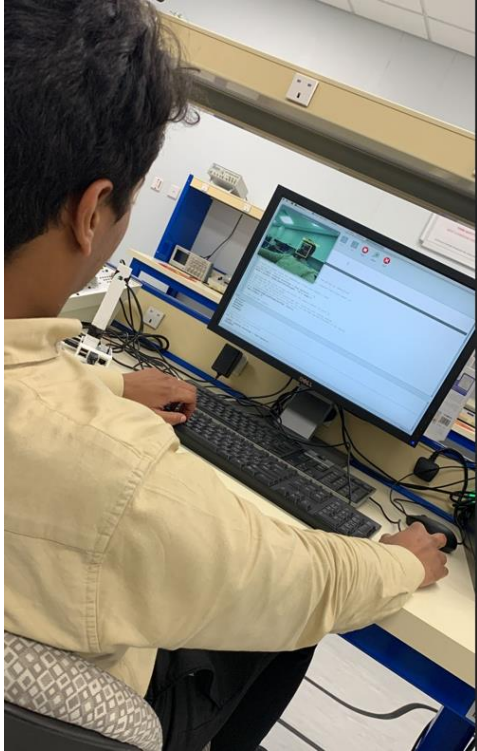
Challenges:

- Chassis building.
- Chassis material.
- Chassis design (shape and structure).
- Installing OpenCV Files on the Raspberry Pi .

Decisions made:

- Building chassis using 3-D printer.
- Less weight & heat resistant material.
- Designing our own chassis' structure on paper to lower the cost.
- Uploading the updated OpenCV files.

Project management & Teamwork



Risk Management

	Source	Events	Threats	Response
1	Battery Depletion	Power Loss	None	Replace batteries
2	PC/Microcontroller	Failed to upload files	Program & Data loss	Uploading the updated version
3	Motors	Not handling the car's weight	Slow Car Movement	Replace with more efficient Motors
4	Motor's Installation	Screws cannot be installed	Motors will not be mounted correctly	Find a better screws



Impact of Project

- Human interaction with securities will be reduced.
- Being in restricted areas where it's not safe will be reduced.
- Infection spread will be minimized.
- Waiting lines in gates will decrease.



New Skills Acquired & Applied

- Team work.
- Research skill.
- New programming language skill acquired (Python).
- Bigger tasks divided to into small ones.
- Efficient & Fast troubleshooting skill.
- Knowledge transfer.

Cost Estimate

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
1	Arduino Mega 2560	1	300	300
2	Raspberry pi 2	1	300	800
3	Ultrasonic Sensor	1	100	100
4	Flame Detector Sensor YL-38	1	100	100
5	Motor Driver (L298N)	2	80	160
6	IR Sensors	5	20	100
7	Bluetooth Module	1	50	50
8	WiFi module	1	100	100
9	Servo Motors	2	100	200
10	Chassis	1	500	500
11	DC Motors	4	250	1000
12	LCD Screen	1	120	120
Total				3530



Security Robotic Car (SRC)



Project Definition

Security Robotic Car that reads the health condition on Tawakalna application for entrants. The Robotic Car will also patrol inside restricted areas

Project Specifications

- Detects human through camera's face recognition feature.
- Following black line through IR Sensor for patrolling.
- Operates for a minimum of 30 minutes.
- Reads QR-code in Tawakalna application.
- Detects fire and releasing an alarm.
- Detects temperature and humidity.

- Project Advisor -

Mr. Saifallah Shung

- Group Members -



Mohamed Alghamdi



Ali Abshamrani



Mammour Alowais

References

[Design and Implement a Robot for Security Purposes | IEEE Conference Publication | IEEE Xplore.](#)

[Dyson's Robot Vacuum Has 360-Degree Camera, Tank Treads, Cyclone Suction - IEEE Spectrum .](#)

[Smart mobile robot for security of low visibility environment | IEEE Conference Publication | IEEE Xplore.](#)

[\(PDF\) Arduino based, Bluetooth controlled RC Car \(researchgate.net\).](#)



Thank You