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

WHEELCHAIR +

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Advisor: Dr. Hirenkumar Kantilal Mewada

May 17, 2022

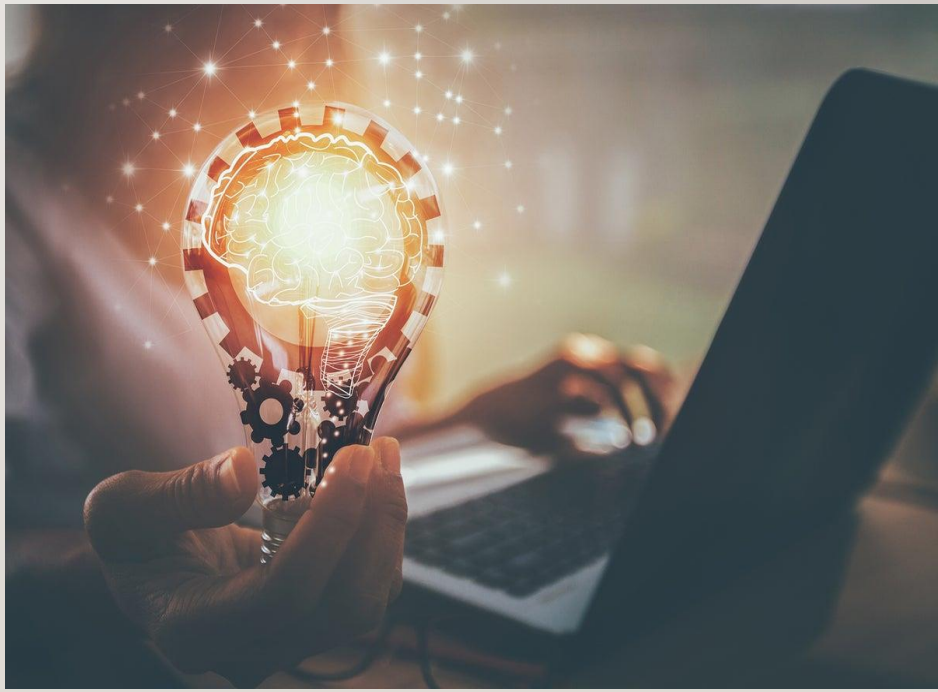
OUTLINE

- Project Definition
- Project Objectives
- Project Specifications
- Project Constraints & Standards
- Project Architecture
- Planning
- Background
- Design: Subsystems & Components
- Testing
- Project Mgmt. & Team Work
- Impact of Project
- New Skills Acquired/Applied
- Completed Work
- Remaining Work
- Total Cost
- References

PROJECT DEFINITION

To enhance the electric wheelchair for people with special needs & elderly who are unable to move on their own.

The wheelchair will have features to control by specific voice commands, Joy Stick i.e. Dual Functionality + features like obstacle avoidance & GPS tracking that the chair will understand and implement.



PROJECT OBJECTIVES

- Increase features to contemplate ones who cannot control the wheelchair individually & make the person Independent.
- Efficiently adopting the use of audio signals to save time, conserving energy and provide self-control.
- Provide adequate and automatic safety measures to ensure the protection of the user.
- Enabling the wheelchair to function both manually and automatically with maximum efficiency and minimum errors.

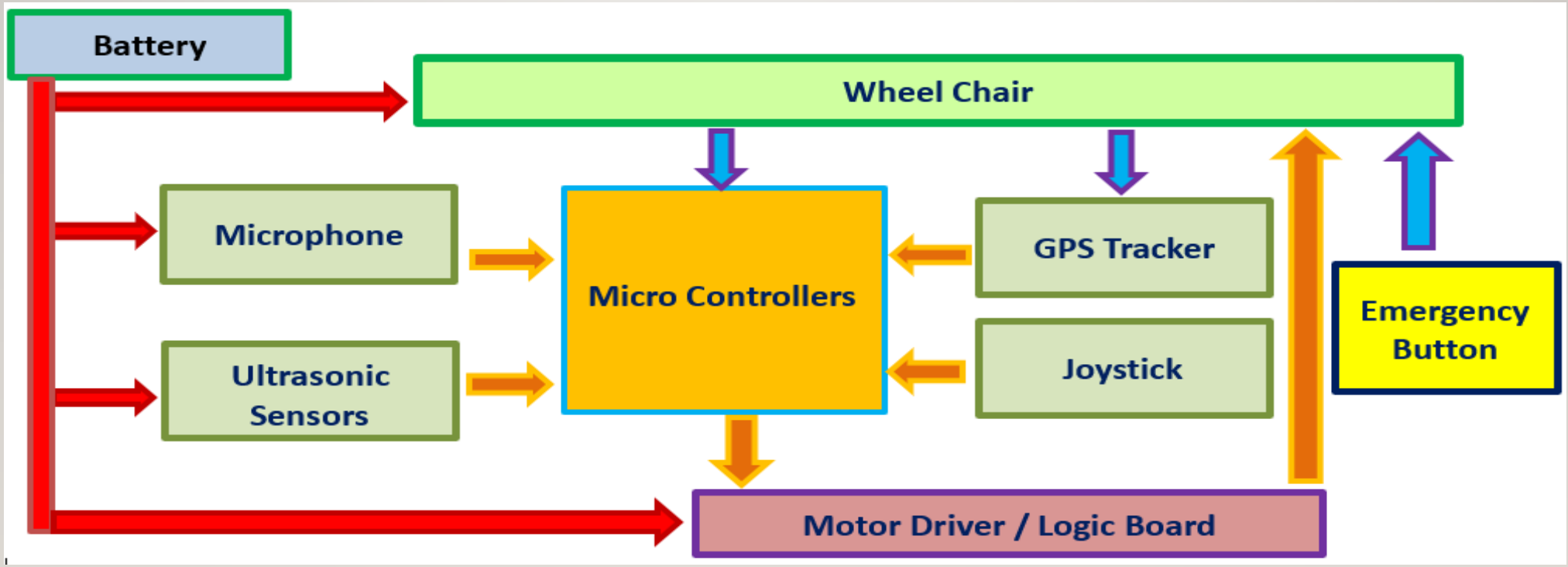
PROJECT SPECIFICATIONS

- Recognizes specific audio input through the microphone for movement.
- Has dual functionality i.e. controlled by both voice & joystick.
- Traces location of the wheel chair to keep the caretakers aware through GPS.
- Automatically detects & stops if any obstacles are in the way through sensors.
- Has an emergency button to halt operations if any malfunction/problem occurs.
- Has a sitting space for 1 person & weight capacity of up to 100 kg.
- Estimated internal power supply 24V, DC Lithium-Ion battery.

DESIGN CONSTRAINTS & STD.S

- (Social) Privacy: People think/believe they will be spied upon by the mic.
- (Skills) Lack of Knowledge: People lack knowledge to operate smart devices properly.
- (Financial) Budget: Total cost varies between 4-5 thousand SAR.

PROJECT ARCHITECTURE



PLANNING

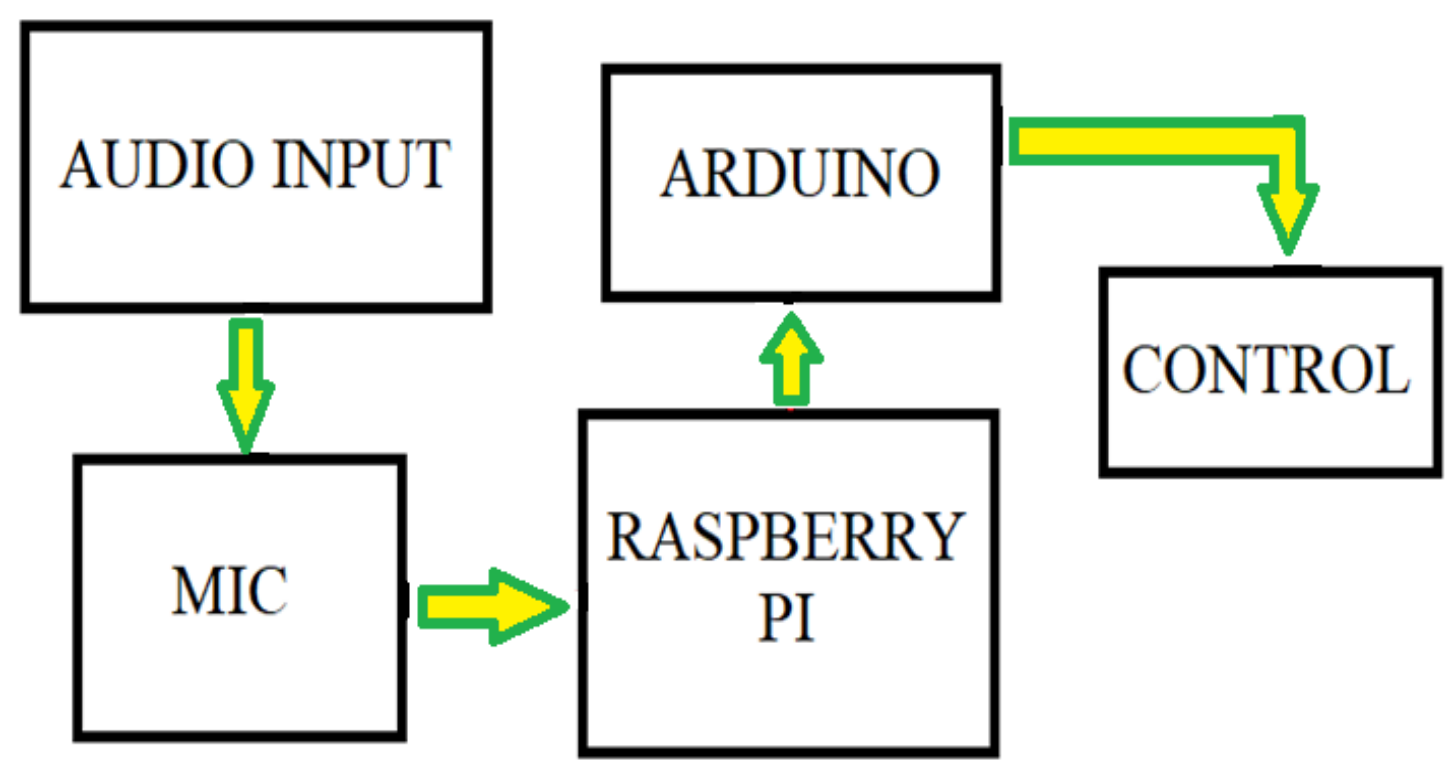
- Did we verify the project feasibility?
- Did we verify that all components will be available locally or can be ordered within a reasonable time?
- Did we verify that the required testing can be performed at PMU Labs (instruments and technical help availability?)
- If not where can we get help, test …..

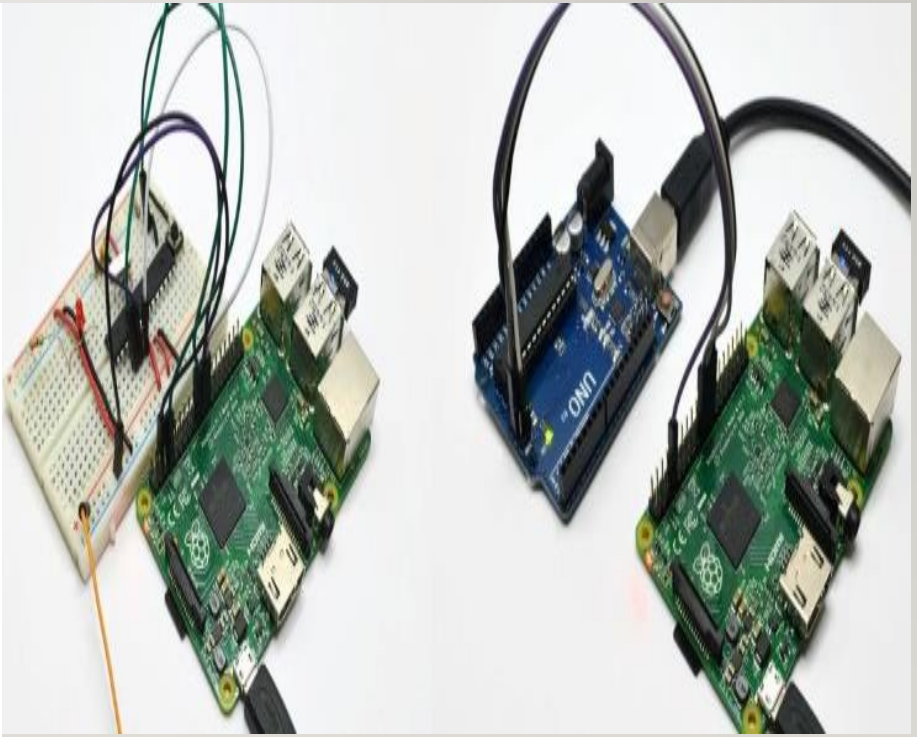
BACKGROUND

- **Voice Controlled Functions**
  - Gives ability to control a wheelchair without the need of hands.
  - The person can move independently.
- **GPS Tracking**
  - Gives ability to track the wheelchair for safety purposes.
  - Loved ones stay aware.
- **Automatic Obstacle Avoidance**
  - Helps the wheelchair to avoid obstacles automatically & efficiently.
  - The person can move very safely.
- **Multi Layer Control**
  - Enables the wheelchair to be controlled by both audio & joystick.
  - Minimizes chances of malfunction.

DESIGN: BASE

DESIGN: SUBSYSTEM 1

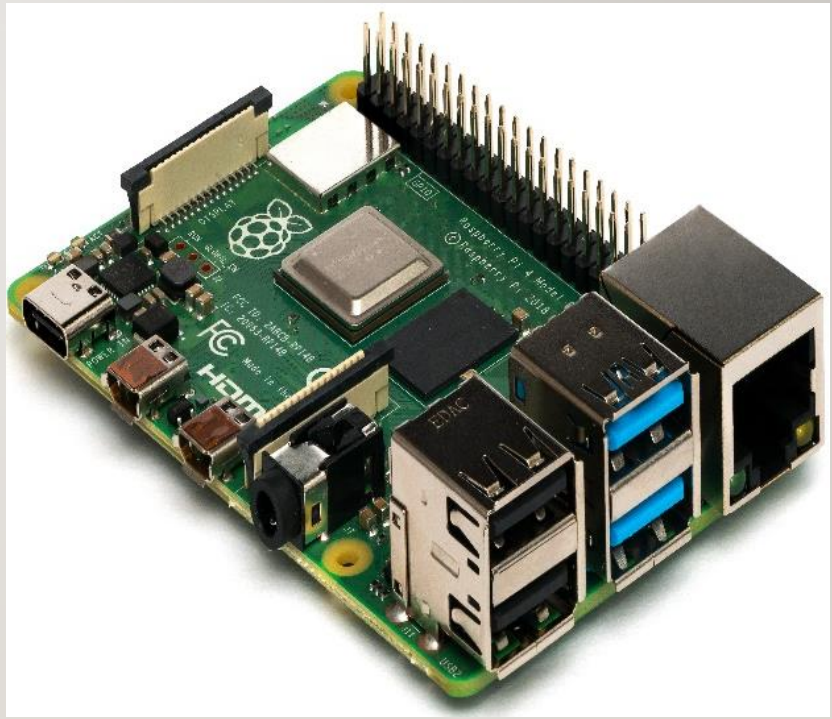




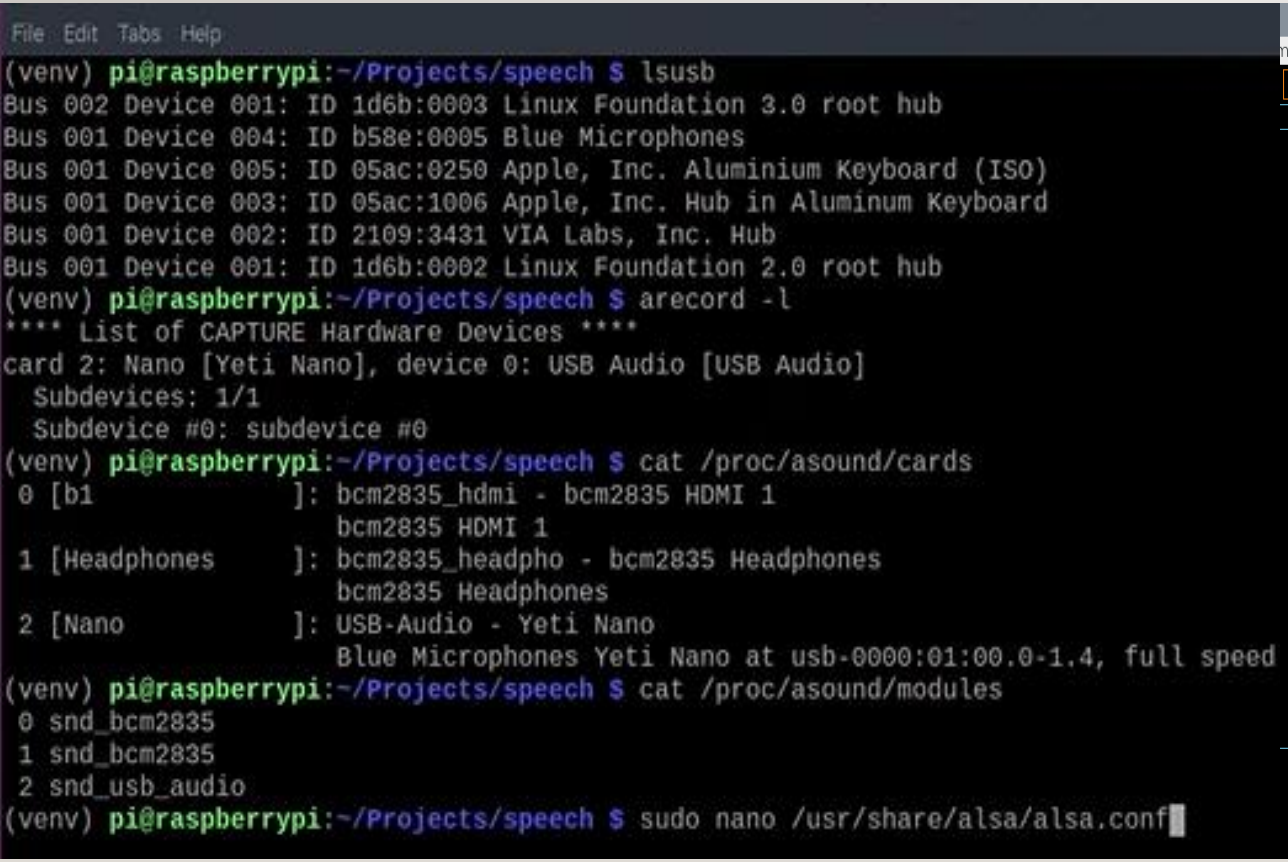
DESIGN: MICROCONTROLLER

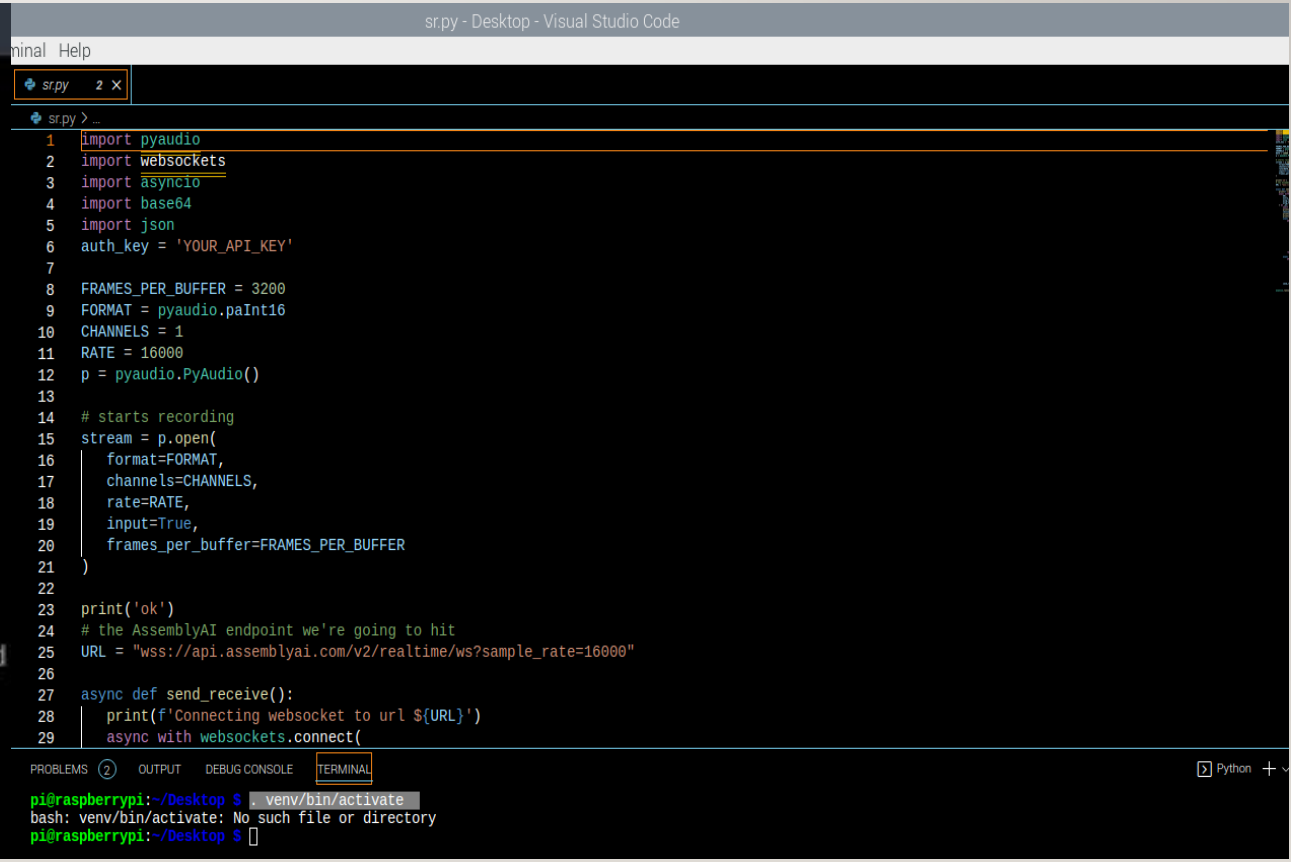
- **Raspberry Pi**

4 Model B

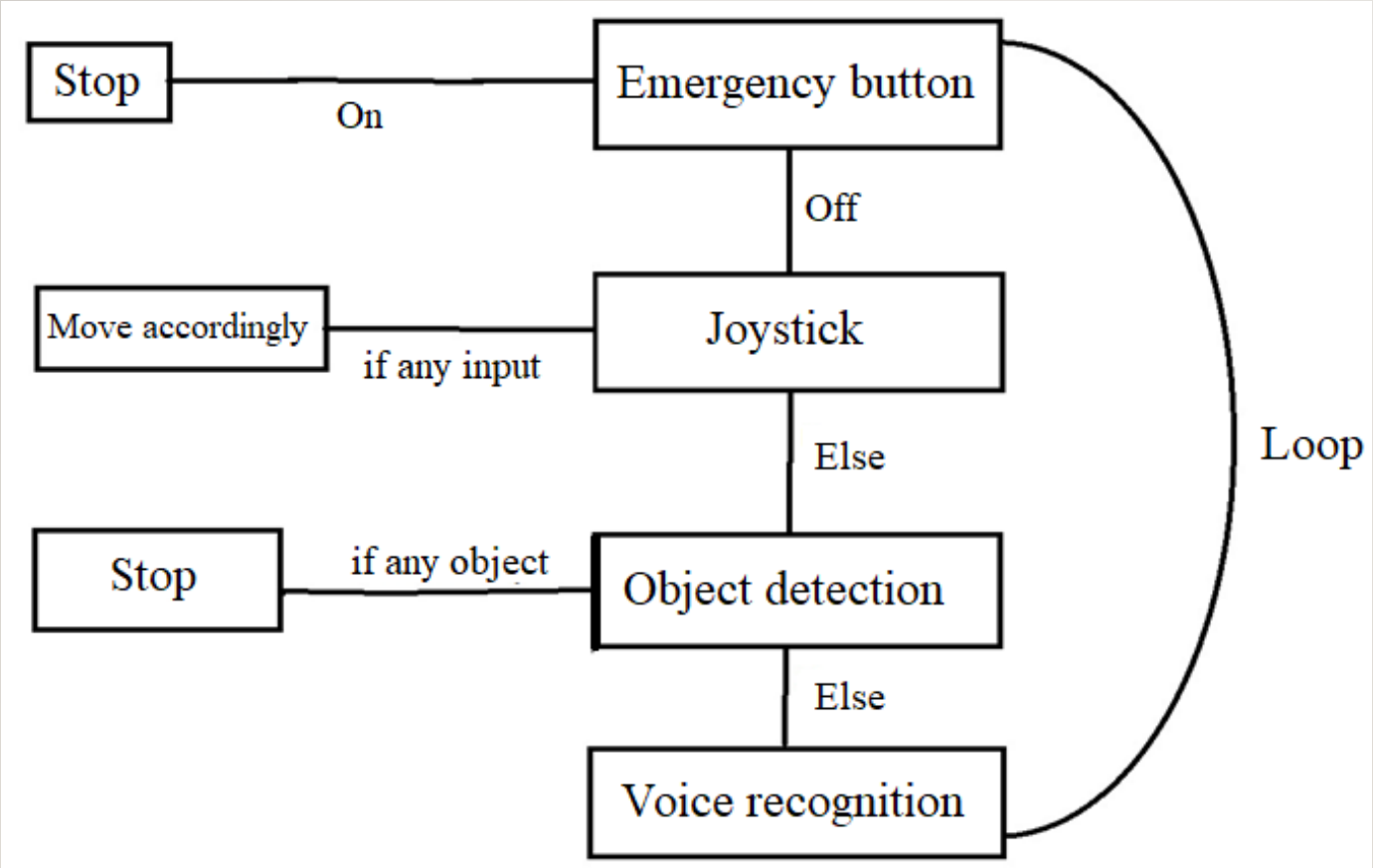


DESIGN: CODING [PYTHON]



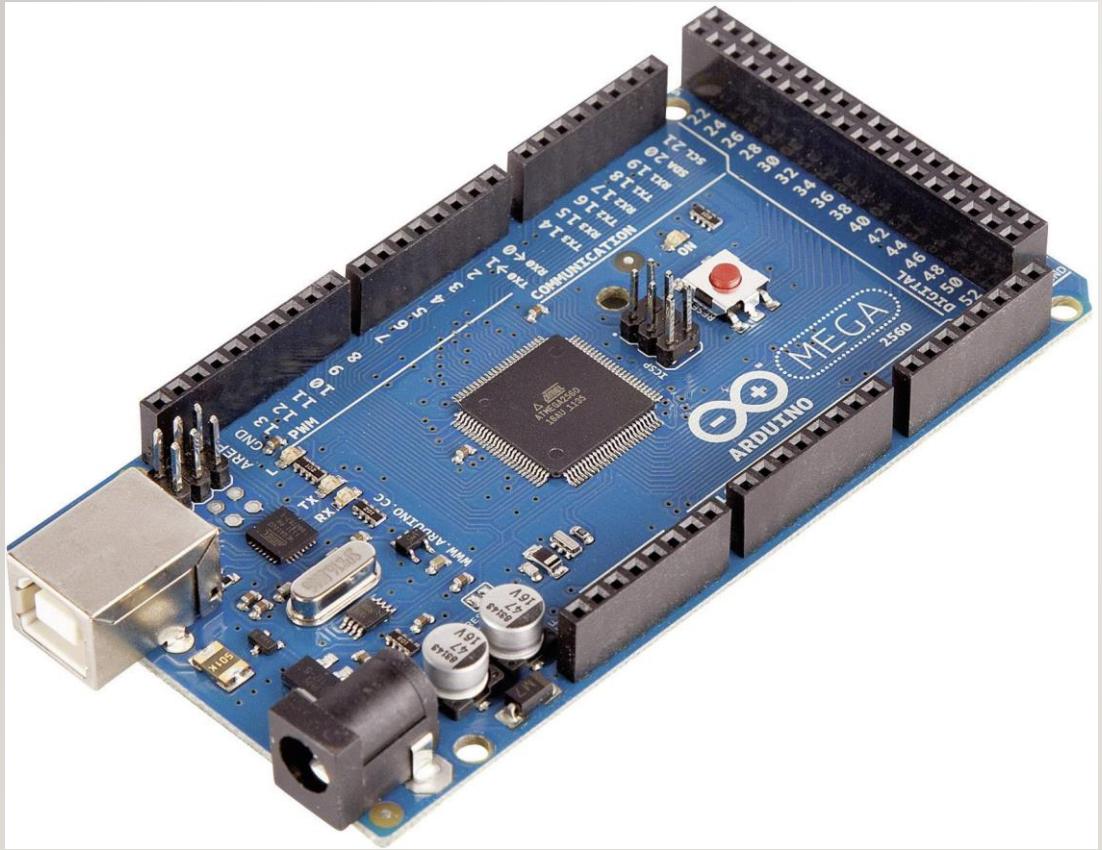


DESIGN: SUBSYSTEM 2



- **Priority Listing**

DESIGN: MICROCONTROLLER



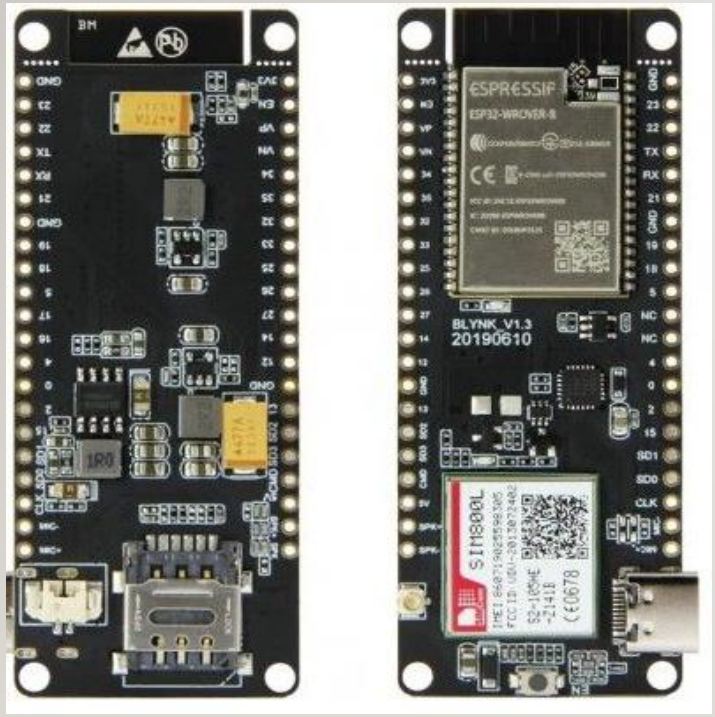
- **Arduino Mega 2560**

ARDUINO

DESIGN: VOLTAGE DIVIDER

F	Forward	Sets A to 5 volts & B to 2.5 volts
B	Backward	Sets A to 0 volts & B to 2.5 volts
S	Stop	Sets both A and B to 2.5 volts
L	Turn left	Sets A to 2.5 volts & B to 0 volts
R	Turn right	Sets A to 2.5 volts & B to 5 volts

DESIGN: SUBSYSTEM 3



ESP32 + GSM GPRS COMUNICATION MODULE

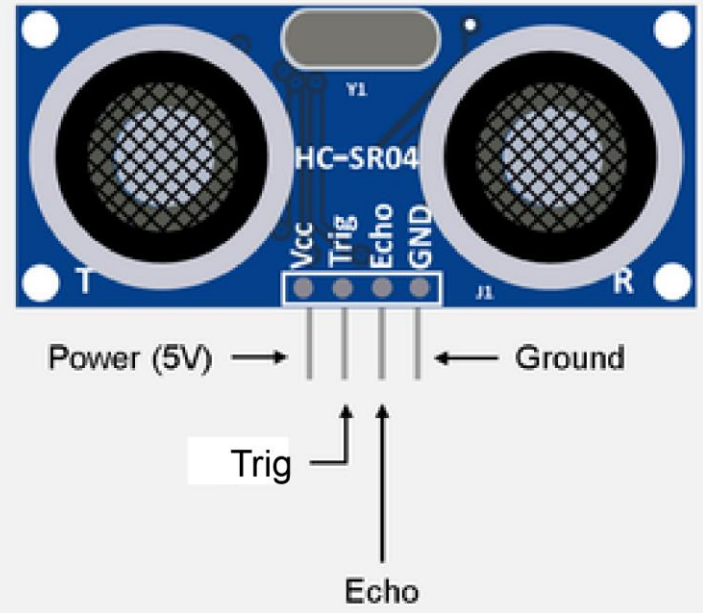
NOE 6M GPS Module

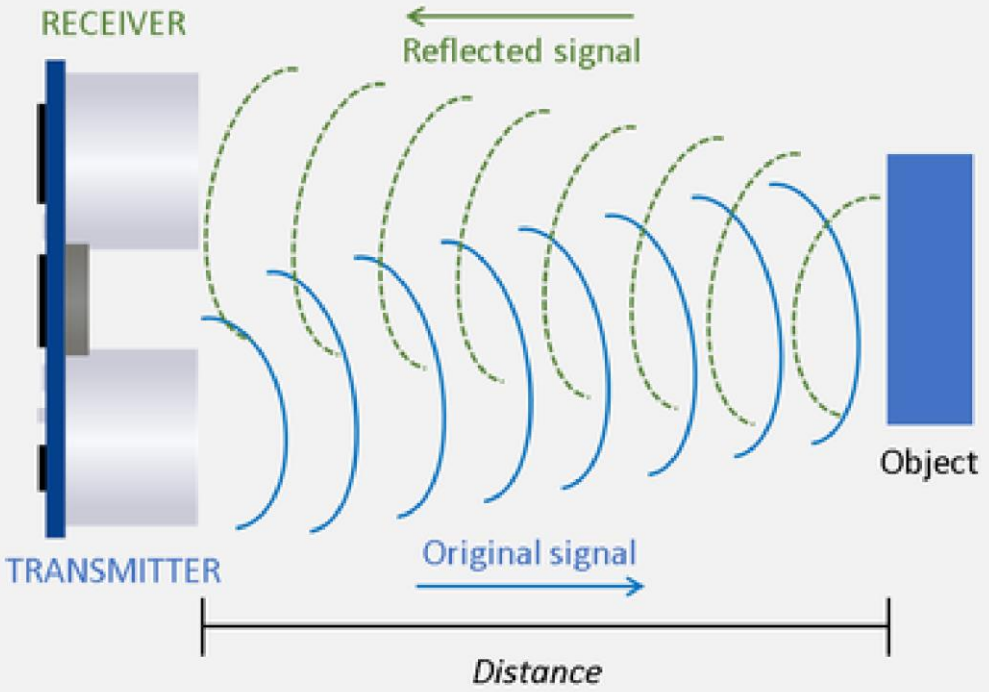
Rechargeable lithium battery 5V

DESIGN: APPLICATION

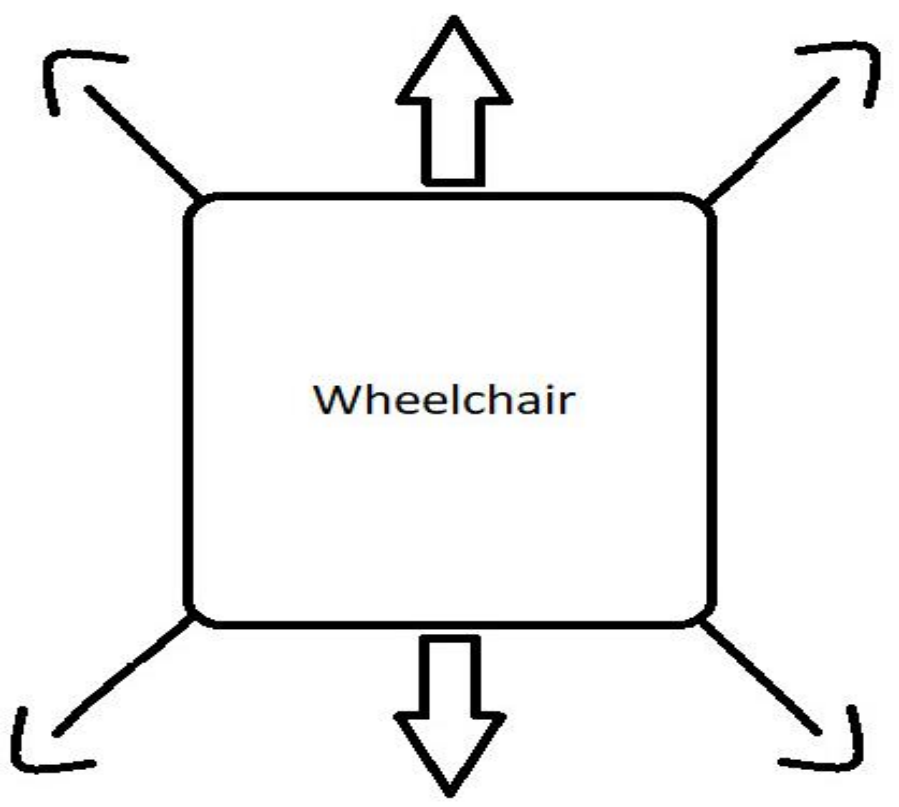
- **Location Viewing**

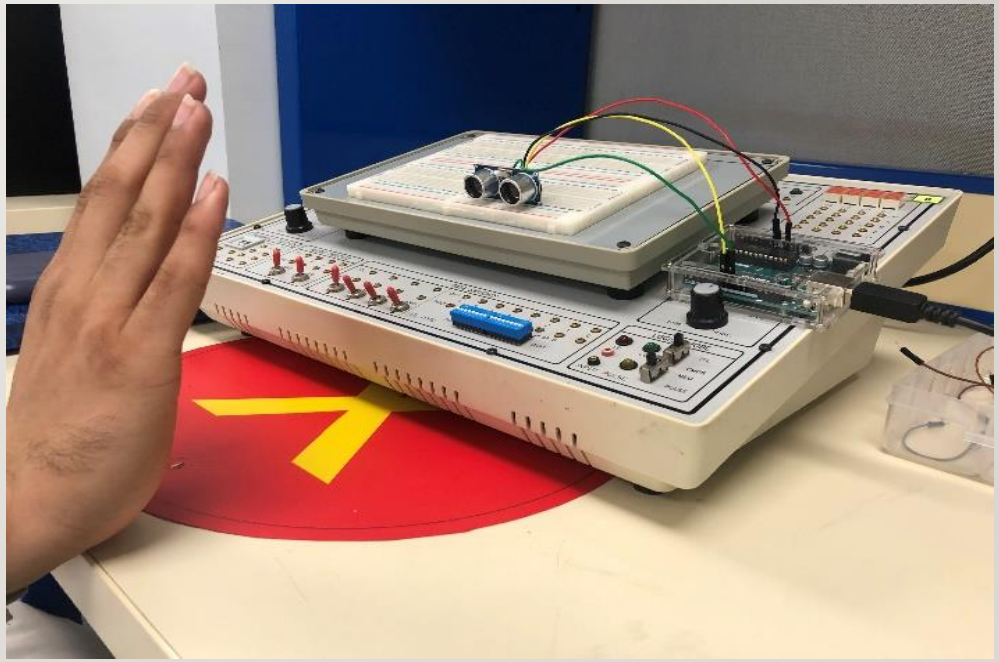
DESIGN: SUBSYSTEM 4





DESIGN: VIEWING

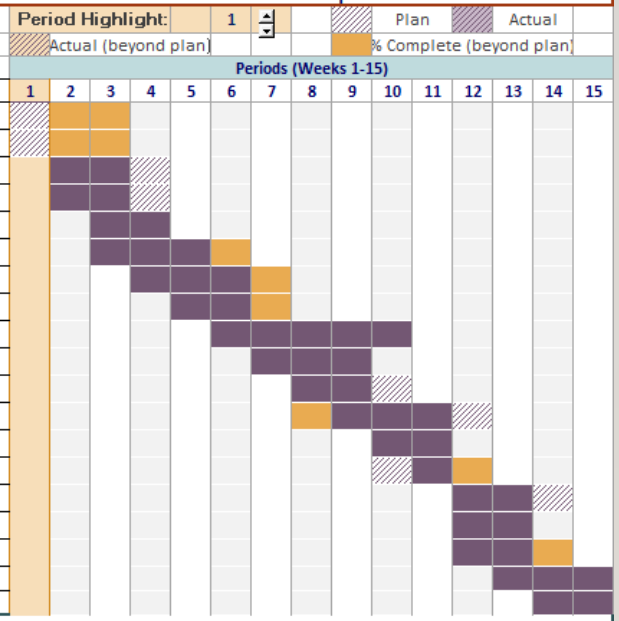




PROJECT MGMT. & TEAM WORK

Title: Wheel Chair +		Advisor: Dr. Hirenkumar Kantilal Mewada	Design II (ASSE 3)	Spring 2022
Ali Khan	201701348	[AFK]	Project PLAN & Progress	
Abdullah AlKhalifa	201700776	[AAK]	ProgRpt No. 6	
AbdulRahman AlShanqiti	201701387	[AAS]	Plan updated (Date): May 17, 2022	
Ali AlQambar	201701325	[AAQ]	Instructor: Dr. Sadiq Alhuwaidi	

ACTIVITY	PLAN START	PLAN DURATION	Assigned To	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Update Specifications	1	1	ALL	2	2	100%
Write Plan	1	1	ALL	2	2	100%
Order & Get Remaining Components	2	3	ALL	2	2	100%
Complete Subsystem 1 (Voice Control)	2	3	AFK	2	2	100%
Test Subsystem 1	3	2	AFK	3	2	100%
Design Subsystem 3 (GPS Tracking)	3	3	AAS	3	4	100%
Test Subsystem 3	4	3	AAS	4	4	100%
Prepare Midterm Presentation & Video	5	2	ALL	5	3	100%
Display Data to End-User	6	5	AAK	6	5	100%
Design Subsystem 4 (Obstacle Avoidance)	7	3	AAQ	7	3	100%
Test Subsystem 4	8	3	AAQ	8	2	100%
Debug all Programming Code	9	4	ALL	8	4	100%
Implement Complete Design	10	2	AAK	10	2	100%
Integrate all Subsystems	10	2	ALL	11	2	100%
Final Testing	12	3	ALL	12	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/Video...etc.	14	2	AFK, AAS	14	2	100%



Progress Details:	Issues (delay, etc.):
Final Working Getting things ready for Open Day	1- Time Management

PROJECT MGMT. & TEAM WORK

Task	Ali Khan	Abdullah Alkhalifa	Ali AlQambar	Abdulrahman
Search & acquire components	25%	45%	5%	25%
Design & implement subsystems	25%	25%	25%	25%
Testing & debugging	25%	25%	25%	25%
Write reports & presentations	45%	25%	5%	25%

PROJECT MGMT. & TEAM WORK

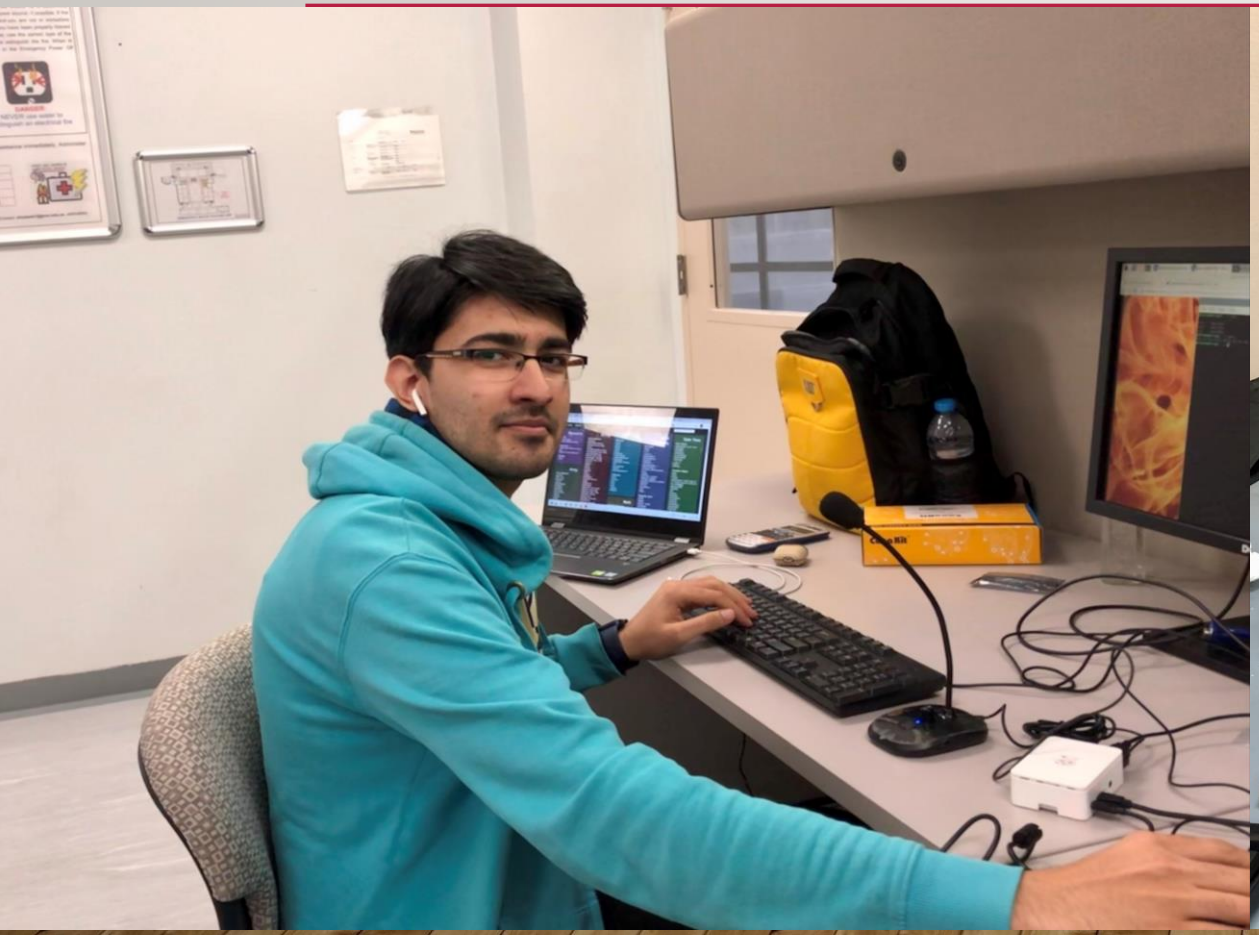
Challenges & Decision making:

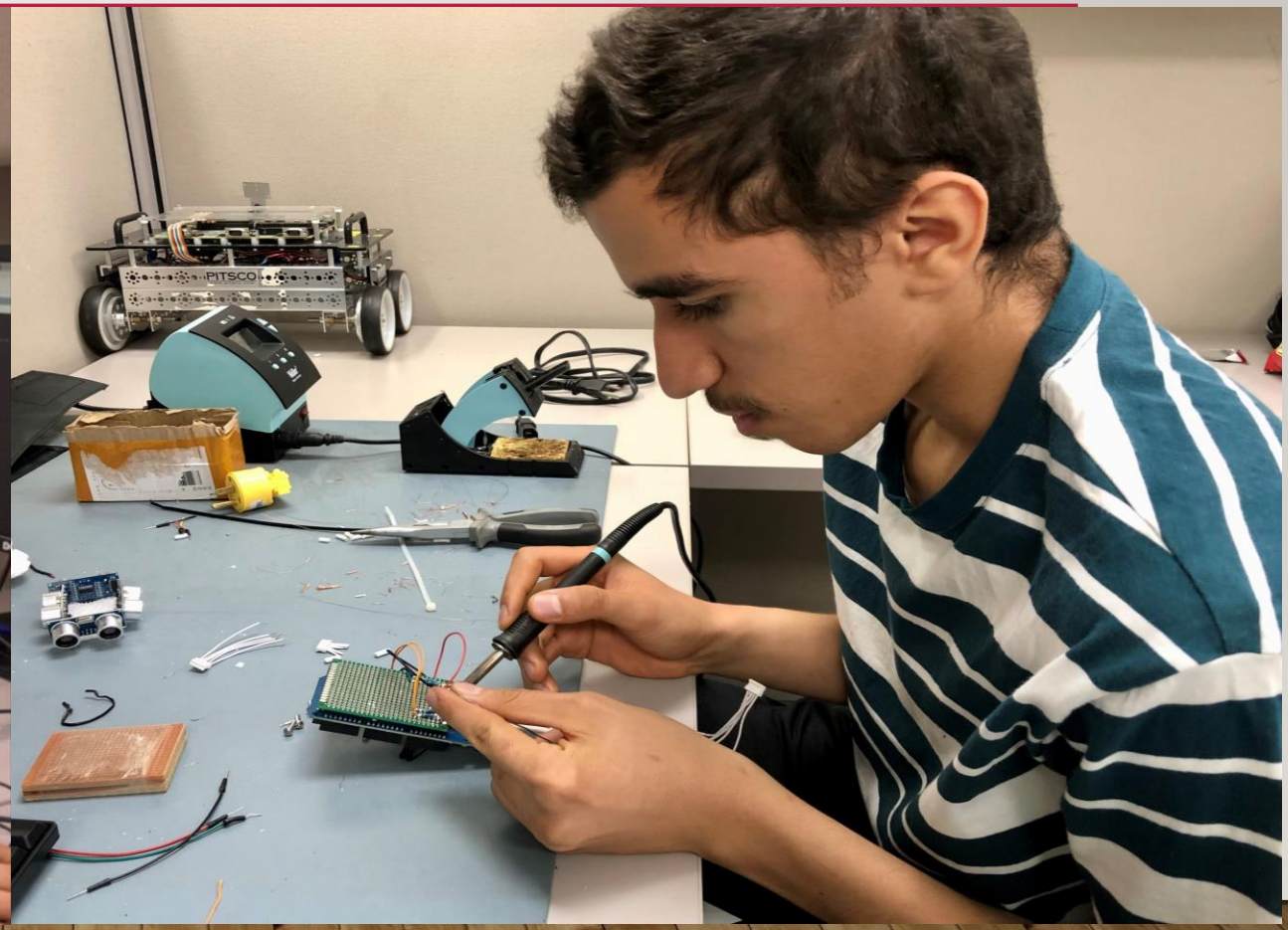
- Balancing between online & on-campus classes + work by staying late or making special visits.
- Time management & COVID protocols.
- Delivery delays + technical issues.
- Extra curriculum activities.

RISK MANAGEMENT

Concerning	Events	Threats	Response	Source
Logic board	Short circuit	Inability to function	Fix or get new	Wheelchair
Team members	Illness / Injury	Development & testing delays	Sickness is unpredictable & unavoidable.	Team members

PROJECT MGMT. & TEAM WORK





PROJECT MGMT. & TEAM WORK

IMPACT OF COVID ON PROJECT

- Mix between online & on-campus classes caused a very stressful situation for students similar to chaos.
- Issues with availability of some components due to shipping delays.
- Difficult to meet & work on the project.
- Unnecessary rise in prices.

IMPACT OF PROJECT IN SOCIETY

- Moving away from dependency i.e. user becomes independent.
- Extremely positive impact as it provides features for those who were never given any.
- Relieved people from worrying about their loved one that cause stress.
- These features will someday become the basic standard of a wheel chair.

FUTURE POSSIBILITES

- Simplification of the process by only using the Raspberry Pi.
- Placement of a camera to monitor the physical state of the user.
- Emergency Notification Protocol ‘ E.N.P ’
- Save voice commands to only work for specific people.

NEW SKILLS ACQUIRED/APPLIED

- Learnt & familiarized with Raspberry Pi & its software.
- Ability to work with the internal circuitry of a complex machine.
- Process of making professional & technical reports & presentations.
- Connections between different microcontrollers.
- Teamwork & problem solving enhancement.

TOTAL COST

No.	Description	Quantity	Unit Cost (SR)	Total Cost (SR)
1	Electric Wheel Chair	1	3619	3619
2	Microcontroller	2	200	400
3	Mic	1	66	66
4	GPS Tracker	1	200	200
5	Ultrasonic Sensor	12	5	60
6	Fixing Issues	1	300	400
7	Deliverables	1	350	350
8	Misc. Chips & Components	…	…	Approx. 35
			Total	5000

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ANY QUESTIONS

THANK YOU