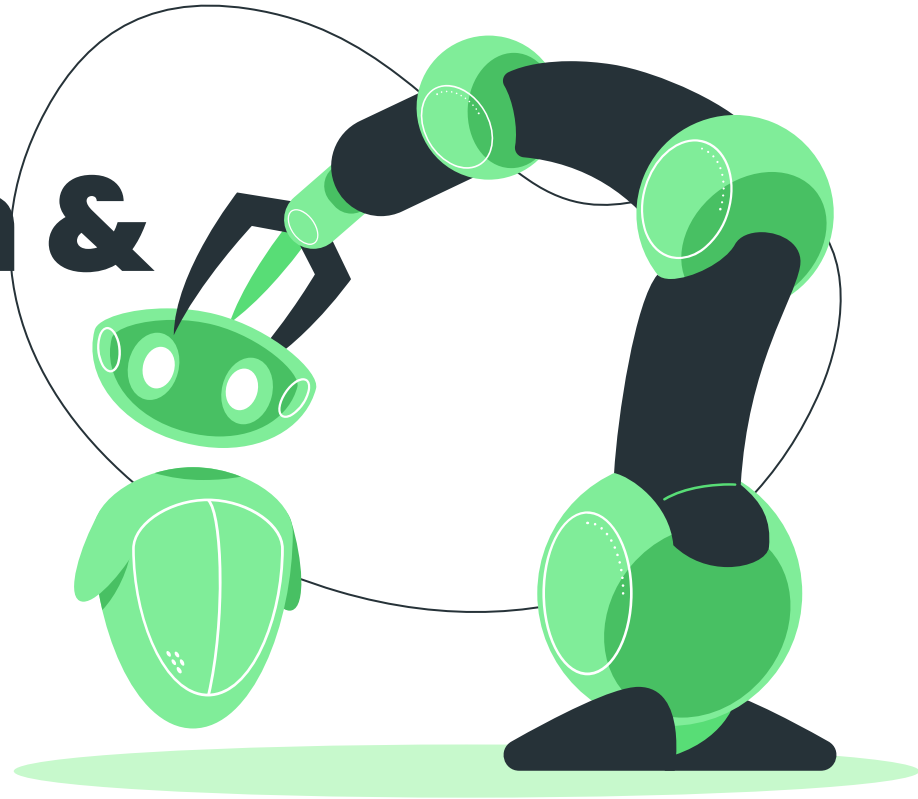


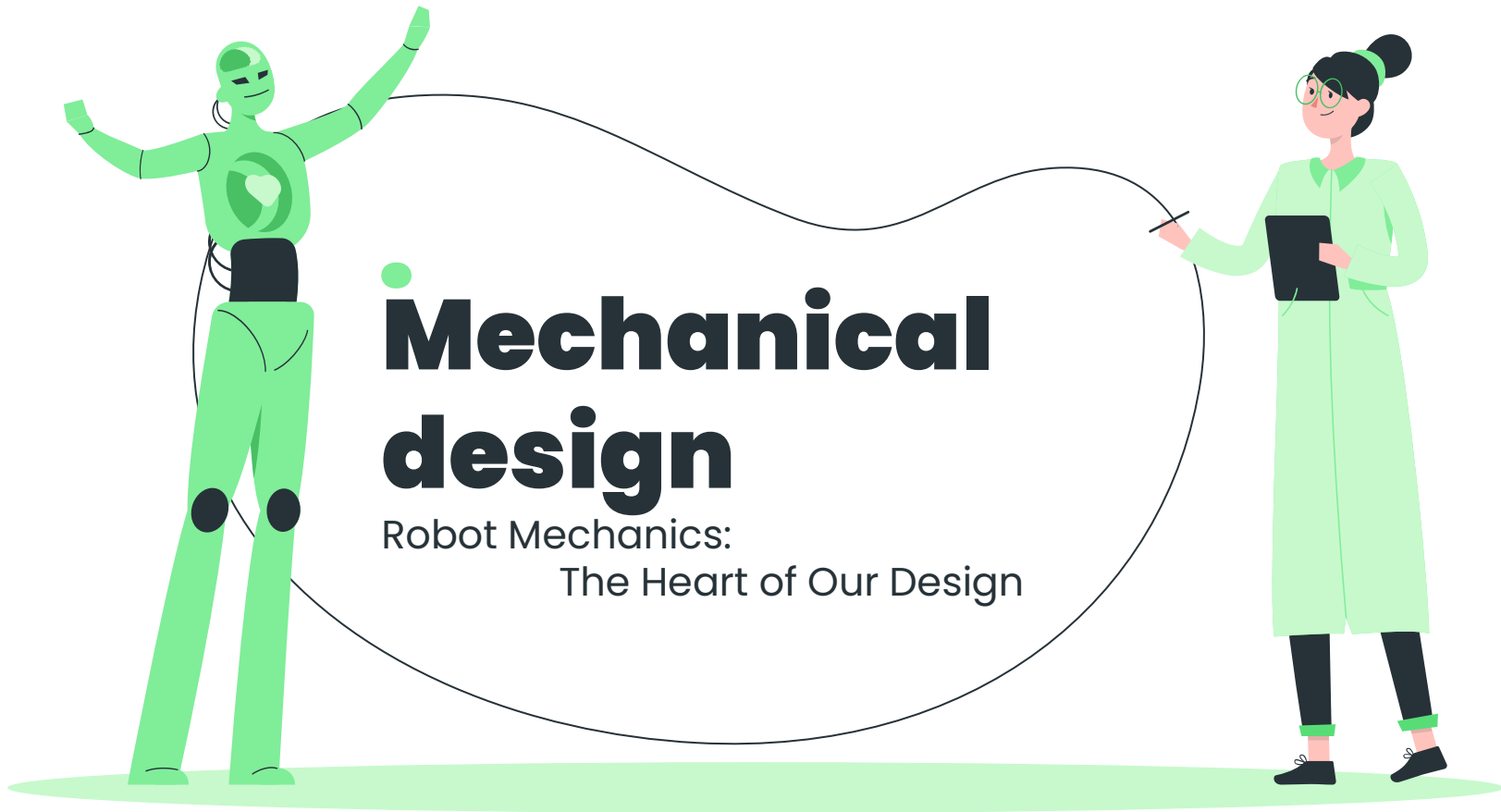
Team Cosmo

Robot Design & Competition

TEAM MEMBERS

- 210069F
- 210174X
- 210205V
- 210258J
- 210542B





Mechanical design

Robot Mechanics:
The Heart of Our Design

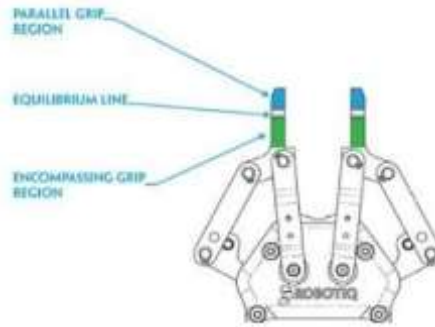
Mechanical design



Menstore

2 wheel design

robot design offers greater agility and simplicity, reducing cost and complexity compared to four-wheel designs with wheel encoders.



Mechanical arm

Mechanical arms on two-wheel robots enable precise manipulation, enhancing adaptability for various tasks, making them preferable.

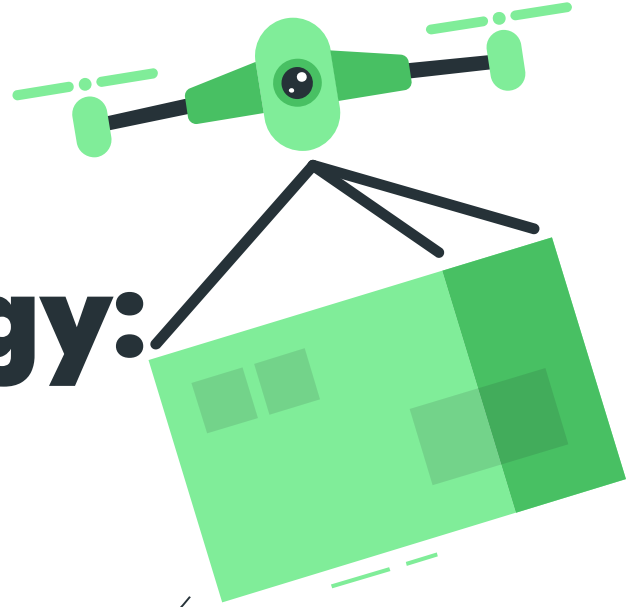


2 supporting wheels

Our 2-wheel robot design features 2 front supporting wheels, preventing collisions during the slope-climbing phase.

Overall strategy:

How We Guide Our Robot to Do Its
Job: A Simple, Effective Plan



Overall strategy:



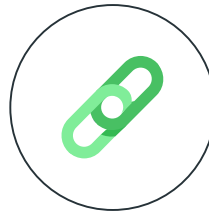
PID Control

Main Method of Movement



Level increment

When IR arrays light up, move the bot 5 cm forward for confirmation.



Turns at checkpoints

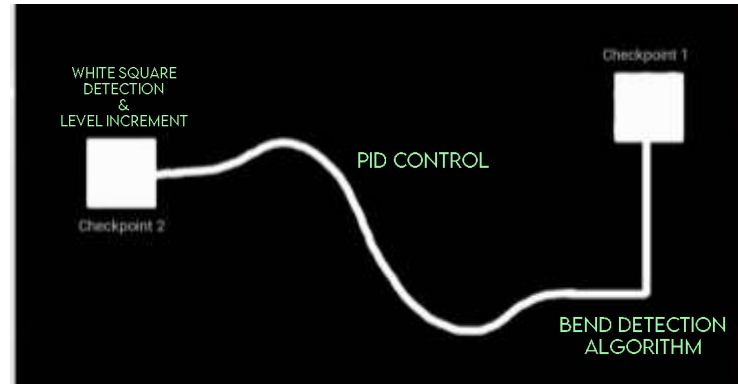
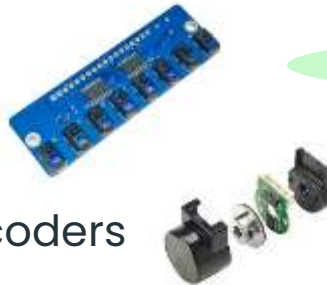
If uncertain on white boxes, try all 3 directions to find a way.
(Path finding algorithm)

Subtask 1

- Calibration
- PID control
- Bend detection algorithm
- Turning 90 degrees using encoder readings

SENSORS

- Aptinex IR 8x array
- Magnetic motor encoders

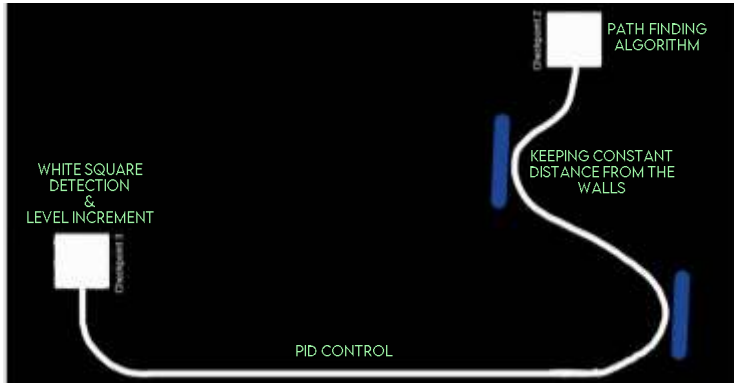


Subtask 2

- PID control
- Distance sensors at the front to detect the walls
- Distance sensors at the side to keep a constant distance from walls

SENSORS

- Sharp IR sensors
- Ultrasonic sensors/ToF(Time of Flight) sensors

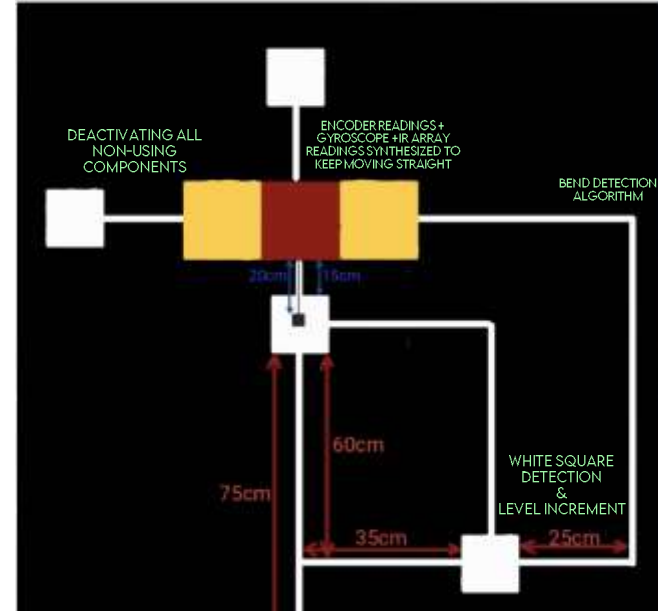


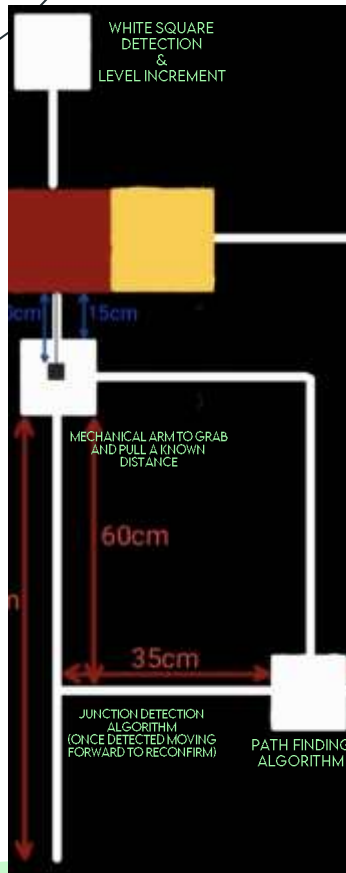
Subtask 3- A

- Turning off all non-using sensors
- Angle measuring sensors to move straight on the ramp + wheel encoders for straight movements
- Using IR array readings in case the robot moved out of the ramp

SENSORS

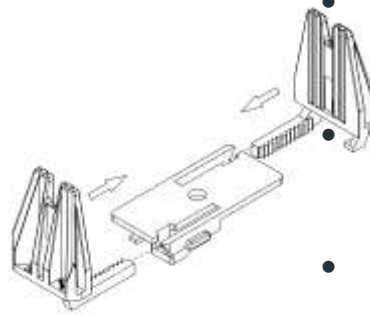
- Gyroscope (MPU6050)





Subtask 3 - B

- Algorithm to detect T junction
- Use predefined lengths to move to desired locations
- Mechanical arm to grab the object (which can slide up at idle)
- Grabbing the object and pulling back with the arm, travelling across pre-defined bends

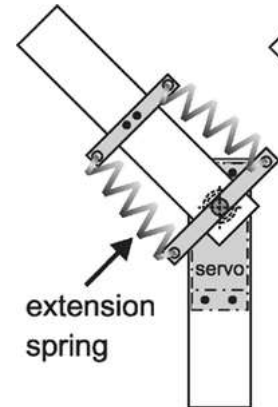


SENSORS

- Sharp IR sensor

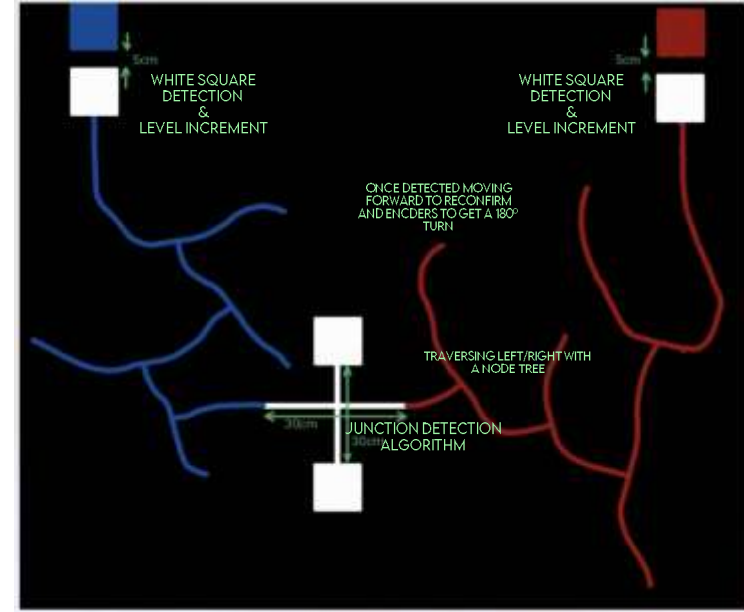
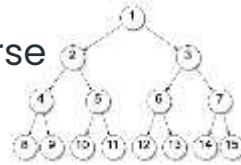
ACTUATORS

- Servo based joints



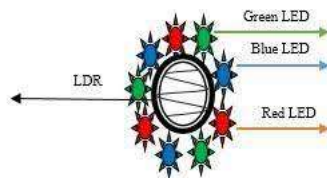
Subtask 4

- Cross junction detection algorithm
- Distance sensor to identify the box and color sensor to scan color
- Node tree algorithm to traverse through the maze
- Analog IR readings to detect blue and red lines
- Unloading the load using predefined lengths (encoder readings)



SENSORS

- Home-made color sensor (LEDs and LDR)

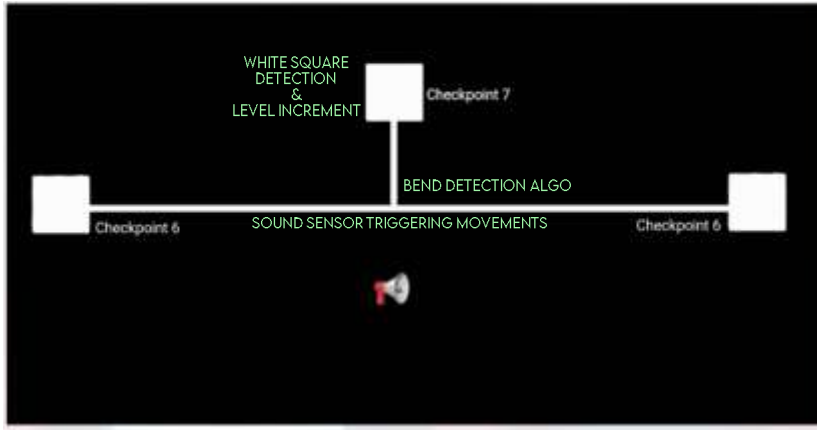
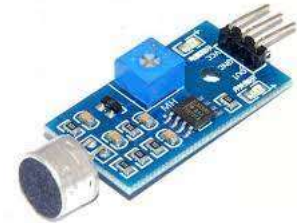


Subtask 5

- Sound sensor to trigger movements
- Deciding the direction to turn by pre-chosen color
- Bend detection algorithm

SENSORS

- Sound sensor

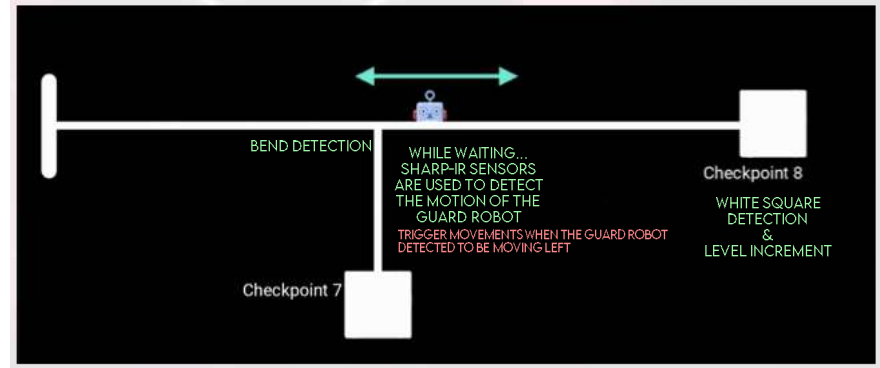


Subtask 6

- Front sharp IRs to detect the movement direction of the guard robot
- Bend detection

SENSORS

- Sharp-IR sensors



Task delegation



Yasiru

Mechanical Design, Maze Traversal and Navigation



Hasitha

Mechanical Arm design and implementation, Algorithm development



Linuka

Sensor implementation, simulation, Documentation and Reporting



Kavindu

Circuit implementation, Algorithm refinements, Troubleshooting and Debugging



Lasith

Algorithm development, PCB design, Battery and Power Management



Thanks!