ELECTRICAL TEAM TRAINING

TASK 13

Group Tasks

TASK13.1- Positional Control

Preface

On a quiet side of Cybertron, away from the big battles and heroic speeches, there was a small Autobot named **TurtleTron**. He wasn't built for speed or combat. No blasters. No wings. Just two wheels, a sturdy frame, and a good processor. What TurtleTron did have, though, was **something special**: a knack for getting where he needed to go **precisely**. While other bots relied on brute force or luck, TurtleTron used something older and smarter: **PID control**. It wasn't flashy, but it worked.

About

TurtleBot PID positional control involves using a **PID controller** to precisely control the robot's movement and orientation

Requirement

- Using gazebo make Turtlebot to move in any position (x,y,theta) autonomously using PID controller
- Subscribe to the /move_base_simple/goal topic to receive target poses from RViz's 2D Nav Goal tool and use it as a setpoint for the PID controller for the robot position

Bonus:

- Make this task using your customized built robot that you have made in the transformations task

Appendix

Turtlebot3 Docs: Turtlebot3 Docs

TASK 13.2 - Build It

About

On Cybertron, the Autobots are preparing for the next Robocon challenge. Optimus Prime assigns Wheeljack and Bumblebee to design a new robot ally. Every mechanism must be chosen carefully — the arms, the lift, the belts, even the movement base. Each motor is a spark of power, and the right choice will decide whether the machine is fast, strong, or precise. With limited resources, they must scour Earth's markets and Cybertron's databanks to find the perfect motors.

Requirements

Using your submissions and final ideas in the **Robocon Ideation** Task you are required to do the following:

- For **each mechanism** on the robot(robotic arm, fork lift, belt, etc….) mention the **number of motors** needed in the mechanism and for **each motor you will need to specify the following:**

  - Select a specific motor on the internet and give links to the motor selected
  - An estimate or a range for the weight that the motor will be moving

- Provide a detailed explanation for the motor selection, including motor type, torque, and other relevant specifications.
- Justify the choice of motor by discussing type, torque, and suitability for the application.
- How do you intend to get the motor ,where will you buy it from

- Do the same for the movement bases

Individual Tasks

TASK 13.3 - Control Master

About

In the war between Autobots and Decepticons, victory often comes down to control — not just of weapons, but of balance, precision, and timing. Optimus Prime knows that brute strength alone isn't enough. Deep inside Teletraan-1, Wheeljack is working on a new system: a controller that can adapt, stabilize, and guide their machines with perfect accuracy. If it works, it will give the Autobots the edge they need in battle.

Requirements

- Create a general **PID controller class in python** That implements the core functionalities for a PID controller and can be used with multiple applications.

- The class should have methods to do the following:
  - Take the Desired setpoint
  - Updates the current feedback
  - Outputs the computed control signal(manipulated variable)
- You should add all the other needed methods for the class to act as intended.

Bonus

- Test the functionality of the class by simulating any control system application of your choice using your Class as the controller.

  (doesn't need to be an actual simulation just printing the feedback & outputs of each loop will be enough)

Submission

- You are required to submit a link for the video of task 13.1, and a link for the repo containing the code you made
- You are required to submit a document or a pdf of the explanation for your motor selection in task 13.2
- You are required to submit a link for the repo containing task 13.3
- Deadline is at Friday 12/9 at 11:59pm
- Link for submission https://forms.gle/1uLhXBeVQc1LEdaMA