Task 5A: Close Loop Control

Objective

Implement a closed-loop controller to maneuver the three bots to go to the vertices of three different shapes: Hexagon, Triangle, and Rectangle.

The goal is to establish a closed-loop control system using the overhead camera for feedback and sending control commands to the bots from the PC/Laptop. The PC/Laptop will run feedback node to estimate poses of the robots and the controller node/(s) in ROS2 to publish velocities to the robots.

Overview

In Task 2b, we successfully executed a Go-to-Goal scenario in Gazebo, where the bots autonomously navigated to specified coordinates using a simulated overhead camera for feedback. Leveraging our knowledge of kinematics and simple control systems, we controlled the robots. This task aims to replicate the same operation on the hardware.

Building Blocks:

- Execute the feedback node from Task 4b to publish the `\pen1_pose`, `\pen2_pose`, and `\pen3_pose` topics.
- Develop and run a ROS2 controller node/nodes on your computer. This node should subscribe to pen pose topics, implement a P controller, and publish velocities to the bots.
- Utilize the `\pen1_down`, `\pen2_down`, and `\pen3_down` topics with the `Bool` message type to activate the pen down functionality.
- Following are the goal points for different shapes:
    1. **Hexagoan Points:** [[200, 150], [175, 200], [125, 200], [100, 150], [125, 100], [175, 100], [200, 150]]
    2. **Triangle Points:** [[300, 100], [400, 100], [300, 200], [400, 100]]
    3. **Rectangle Points:** [[200, 300], [400, 300], [400, 400], [200, 400], [200, 300]]
- Run the microROS agent to establish communication.

Submission Instructions :

- Record a video of the bots making the shapes, along with a screen recording of the terminal during the initial run.
- Run rqt_graph in a new terminal while recording the video, take a screenshot, and merge the image with the recorded video.

- Upload the video with the title `HB23_<Teamid>_Task5A` (For example: If your team ID is 1234 then, save it as HB23_1234_Task5A).
- Please note that while uploading the video on YouTube select the privacy setting option as **Unlisted**.
- Submit the unlisted youtube link on eYRC Portal