Ain Shams University, Faculty of Engineering

Mechatronics and Automation Program

MCT 431: Autonomous Systems

Milestone 2

Deadline: 28 April, 2023 @11:59 PM

1 Milestone Objective

The objective of this milestone is to implement a go to point controller for our autonomous system. You will be required to implement a controller that (given the desired coordinates we require our mobile robot to reach) will calculate the suitable velocity commands that will allow our mobile robot to reach its destination.

2 Requirement 1

2.1 Description

1. You are required to install the ready made **Turtlebot3** mobile robot package which will be used in the preceding milestones. After successfully installing it you should run the Turtlebot3 robot in Gazebo to verify that the installation was done correctly.

2.2 Submission

For this requirement your going to submit screenshots showing:

1. Gazebo launched with the Turtlebot3 mobile robot spawned at the origin.
2. list of topics available when launching Gazebo with the Turtlebot3 mobile robot.

2.3 Hints & Tips

The PDF "Lab 5 Exercises" contains the details and commands necessary for the installation and launching of the Turtlebot3 mobile robot on Gazebo.

3 Requirement 2

3.1 Description

1. You are required to implement a go to controller that calculates the suitable velocity commands that when published to the Turtlebot3 allows it to reach its destination safely. You are **FREE** to use the controller we implemented in Lab 6 and you are also **FREE** to implement a different controller if you would like. If you managed to implement a different that works correctly, you will get a **Bonus** ☺

3.2 Submission

1. You are required to send a video showing Gazebo running in the background with the Turtlebot3 robot spawned in it. You are then required to open a new terminal and run your python file and give it desired positions and the Turtlebot3 mobile robot should start moving until it reaches the desired destination. In the video show the mobile robot navigating to multiple different points **Behind** and **In Front** of the robot. Use different controller gains and comment on your results.
2. You are required to also send at the end the package you created as a zip file.

3.3 Hints & Tips

Watch the recording of lab 6 to refresh your knowledge on how the controller works to better understand how you can tune your controller. Watch the new uploaded recording called "Milestone 2 & Debugging Guide" to guide you through your implementation.

4 Rules and Final submission

1. Cheating in any way is not accepted, any team that copies the Milestone from another team, both teams get a **Zero**.
2. A late submission will result in grade deduction.
3. You are requested to send the entire package you created as a zip file including any codes, folders and files you create inside the package.
4. You are required to send the screenshots you took for each requirement. The screenshots should have a clear view of the terminal (including the lines written), and the name of the computer must be clear and unique for each Team.
5. Send your zipped package, videos and screenshots to the following email: auto.systems.submissions@gmail.com. In the email subject write "Milestone 2 submission". In the body of the email mention your names, IDs and team number. It is required that only **One** person from the team submits the Milestone.

5 General Message

Although there are not a lot of requirements in this milestone and it may seem easy, it is unfortunately not that easy ☹. Modifying the code in lab 6 to work on the Turtlebot3 in Gazebo instead of the Turtlesim will be a challenging task. The challenge is not only to modify the topics and publishers and subscribers but to also modify the controller as the readings and messages passed between the controller and Turtlebot3 will be different than the Turtlesim. It is **Highly** expected that your mobile robot will not behave as intended from the first time and will move uncontrollably. I know how frustrating this will be but be sure that with patience and a little debugging you will understand why this happens and you will be able to adjust it. The uploaded recording titled "Milestone 2 & Debugging Guide" will help you to debug and understand your code. We will always be available to help and support you through your implementation. Goodluck ☺