PDE4430 Mobile Robotics

Coursework 1 (35%)

2024 – 2025 | Middlesex University Dubai

In this coursework assignment you will write a program to **move a mobile robot in a meaningful way using the Robotic Operating System (ROS) and the TurtleSim.** Your program should be able to successfully perform various tasks with the turtle, including:

- Teleoperation using the keyboard, with an option to change movement speed
- Autonomous navigation to any given coordinate in the Turtlesim window
- Avoiding wall collision – Override movement if wall hitting is imminent
- Vacuum Cleaning behaviour – Covering the entire window in an efficient manner
- Multiple turtles vacuum cleaning behaviour – 2 is good, 3 or more is great

You need to do extensive research to:

- Consolidate the knowledge we have learned in class.
- Expand your knowledge by exploring useful repositories online – In particular: wiki.ros.org.
- Use Python to develop a ROS package that will perform the actions and achieve the required goal in an efficient way - Use multiple nodes, topics, and service calls to achieve the goal.

The submission needs the following:

1. GitHub (or any other remote Git) repo containing the code.
2. A README file containing information about the code, including the algorithm you have developed and instructions on running the project correctly.
3. A video of the project in action.

The project can be achieved by spawning multiple turtles using the built-in ROS service and subscribing to the various pose topics to know the position of each turtle. From then on, it's a matter of developing an efficient way of controlling the various robots to not run into each other and achieve the stated goals in a minimal amount of time. The project will be marked on the following criteria:

25% Approach. Soundness and correctness of the chosen approach

25% Implementation. Appropriate and competent coding solutions; sensible program structure with functions and modularity; bugs and errors; safety checks; code clarity and readability.

25% Performance. Accuracy and reliability in the movement; robustness and generality; user interface and options; The code will be assessed based on how well the turtle (or turtles) move in the space, how much area they cover, and how quickly they manage to cover the entire area (Not based on velocity, but based on efficiency)

25% Documentation. Please include a detailed section on the design and architecture that your program follows. Describe the flow of information, including the nodes, topics and messages that you have created. Feel free to also share the RQT graph of your project. In addition, the code should contain file and function descriptions; suitable line comments;

Due date: November 22, 2024