ASSIGNMENT 1

Task description:

Basic:

Implement an RL to teach your robot how to move in a circle (around some defined point in the 2D space).

Instantiate a MAS of 5-10 robots, where each robot runs the circle following behaviour, and measure the quality of your solution. You can determine yourself the quality metrics to consider.

Advanced:

Use the subsumption architecture with two layers, obstacle avoidance, and circle following. Evaluate the performance of one agent, and continue by scaling the system up to 5, 10, 20 etc. Define quality metrics at the agent level and group level. Evaluate your solution.

ASSIGNMENT 2

Task description:

Basic:

Assume a MAS with 5 agents. Assume a leader agent (pre-assigned, and identifiable by the rest) and the rest follower agents. Implement a nature-inspired mechanism (either ant or bird inspired) that enables the agents to follow their leader, as well as keep some distance between each other (in a straight line or some other formation). No direct communication is allowed between agents. Define the quality metrics and evaluate your method.

Advanced:

Implement a leader election mechanism (e.g., bully). Have agents communicate to decide which position in the fleet to take, use one of the mentioned coordination mechanisms. Scale the number of agents to, 10, 20 etc. Define the quality metrics and evaluate your method.

Reflect on the two solutions. What can be the pros and cons of each? Can you think of scenarios in which one is superior to the other?

ASSIGNMENT 3

This assignment is more open-ended. You get to decide on where your focus will be.

Task description A:

Use RL or some other method to make two platoons cross an intersection. Each platoon has 2 robots. You are expected to use and show your method with the Turtlebots. Define the quality metrics and evaluate your method. Reflect on what it would take to implement your solution in the real-world.

Task description B:

Go into depth with one of the MARL techniques covered in class and investigate how it can be implemented for the Level Based Foraging world. You will use the ir-sim simulator for this. Scale the number of agents in the system, and reflect on the performance of the system.

Task description C:

You can also define your assignment (within reason). Come to us with your proposal and we will agree on something.