

Multi-robot cooperation under signal temporal logic

Description

We are looking for students who are passionate about robotics, control theory and application to join our team. With the development of industry, the production tasks in factories are becoming increasingly complex. Single-robot systems are unable to meet the demands of these tasks. Therefore, multi-robot cooperative operating systems based on signal temporal logic (STL) have recently been widely studied.

The integration of multi-robot cooperation with Signal Temporal Logic (STL) offers numerous benefits for manipulation tasks. It enhances efficiency, robustness, flexibility, and adaptability, while also improving task allocation, load balancing, and fault tolerance. Therefore, the exploration of robot cooperation in conjunction with STL holds significant value in research and practical applications.

Tasks

As a thesis student, you have the opportunity to collaborate with our team in investigating the robot cooperation guided by signal temporal logic. Your task will be using the PyBullet, Mujoco, Gazebo or Omniverse to establish a simulation environment for robotic collaboration tasks such as cooperative handling, object transfer and pipeline operation. After that you have the opportunity to examine your algorithm on real robot.

To achieve this, you will first need to do the literature review on robot cooperation and be familiar with the open source code provided by different papers. The second task will be reproduce the existing algorithm[1]-[3] in your own simulation environment. After that, you can explore your own implementation and innovation. This project will help you develop a robust knowledge base in robotics that can be applied in manipulation robot, as well as provide you with practical experience in robot simulation and real robot operation. Our team is enthusiastic about working with you on this exciting project.

Reference

- [1] M. Sewlia, et. al. Cooperative Object Manipulation Under Signal Temporal Logic Tasks and Uncertain Dynamics, in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 11561-11568
- [2] Leung K, et. al. "Backpropagation through signal temporal logic specifications: Infusing logical structure into gradient-based methods" The International Journal of Robotics Research. 2022
- [3] D. Sun, et. al. Multi-Agent Motion Planning From Signal Temporal Logic Specifications, in IEEE Robotics and Automation Letters, vol. 7, no. 2, pp. 3451-3458, April 2022



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Supervisor:

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Advisor:

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Long Wen, M.Sc.

Research project:**Type:**

BA/MA

Research area:

robotic, simulation, multi-robot
cooperation, Signal Temporal
Logic.

Programming language:

Python or C++

Required skills:

Programming skills in Python or
C++(must have); familiar with
PyBullet, Mujoco, Gazebo or
Omniverse(nice to have).

Language:

English

**For more information please
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