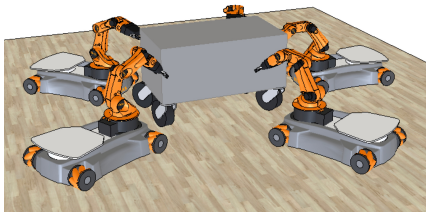
ECE-GY9273 Networked Robotic Systems, Cooperative Control and Swarming

Instructor: Ludovic Righetti



Description Leaderless coordination of teams of mobile, underwater, and flying robots is a fundamental topic for the deployment of robotic systems in the real world. This class will introduce fundamental tools for the analysis and control of networked dynamical systems with an emphasis on the decentralized control of robotic systems. In particular, it will discuss how coordination of multiple robots can be achieved in a decentralized manner for tasks such as environment exploration, monitoring and coverage or multi-robot object manipulation.

Objective Students will learn core techniques for the analysis and control multi-agent systems. They will be able to understand and design algorithms for the distributed control of teams of mobile robots. A particular emphasis will be given on real world applications.

Topics Covered

1. Elements of algebraic graph theory to analyze networked dynamical systems
2. Agreement over networks (consensus algorithms for static and dynamic networks)
3. Formation control (linear and nonlinear approaches, rigidity)
4. Multi-agent estimation and localization
5. Flocking, schooling and virtual potential functions
6. Decentralized coverage control
7. Multi-agent manipulation

Recommended background in robotics or programming (python)

Prerequisites Linear Systems (ECE-GY 6253)

Grading Policy Homework 20% - Project 20% - Midterm 30% - Final 30%