Topics in Autonomous Robotics, Projects SS 2013-2014 – Distributed Intelligent Systems and Algorithms Laboratory

Note: max 2 students per project; register with corresponding assistant; first-to-come-first-to-serve. In case you want to propose your own project, please discuss directly your idea with one of the assistants below. However, note that we will not supervise projects that are not aligned with our research expertise and interest. Tailored projects will have in any case also to be discussed transparently with other faculty before approval in order to insure fairness among all the students attending the course.

Probabilistic Modeling Methods for Distributed Robotic System
The goal for this project will be to study methodologies for probabilistically modeling a distributed robotic system. There are two possibilities to do so:

1. Write a comprehensive literature survey on the topic, focusing on how methods for single robot or centralized multi-robot systems differ from the available approaches for distributed robotic systems. Different probabilistic modeling methods should be described and applications of those discussed.

2. Implement the techniques described during the lecture (and/or others) to model a distributed robotic system. A possible system to be modeled is the wireless connected swarm case study (Winfield et al, 2008) concerned with a swarm of simple robots that has to maintain wireless connectivity. This case study will be extended so that the robots have to execute other behaviors simultaneously, for instance a phototaxis or photophobia behavior. The probabilistic modeling techniques can be implemented in Matlab or similar tools and some realistic modeling (using Webots) will also be required. The student can also propose a distributed robotic system of their own interest to be modeled as long as the guidelines for tailored project mentioned in the header are respected. In particular, the supervising assistant will carefully assess the feasibility of the tailored project within the course constraints, its overall difficulty (for sake of fairness with other students in the course), and take into account his own research interests and time availability.


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Dealing with Noise in Particle Swarm Optimization
The Distributed Intelligent Systems and Algorithms Laboratory is interested in distributed evaluative learning algorithms to design controllers for mobile robots with limited resources. This project focuses on Particle Swarm Optimization (PSO), a relatively new metaheuristic that has shown promising results.

Performance evaluations of robotic controllers are inherently noisy due to several sources of uncertainties, such as sensor and actuator noise, initial conditions, manufacturing tolerances, or changes in the environment. The aim of this project is to study different strategies to deal with noise in the performance evaluations using a visualization tool developed in the lab.

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