

MSc. Project Proposal

**Title: Environmental monitoring with teams of robots**

**Brief description:** Think of the case where a team of robots needs to provide surveillance of a region, measure the quality of the air, the cleanliness of the streets, or inspect the surface of an old building. How do you distribute the robots in the environment? Here you will use the acquired data to create a model over the whole environment and then infer which areas require more measurements. Based on constrained optimization methods for route planning, you will implement an algorithm for multi-robot task assignment and motion planning, which distributes those tasks among the robots and executes them while avoiding obstacles. Robots may communicate information to reach a consensus over the state of the environment. Which information should they communicate? How often? A test case could be a team of boats, which navigate in the canals and measure the water quality.

**Related video from past work:** [https://www.youtube.com/watch?v=te12\\_chaoOE](https://www.youtube.com/watch?v=te12_chaoOE)

**Desired qualities:**

- Motivated and independent
- Good problem solving skills
- Experience/interest in motion planning and/or operations research and/or probability theory
- Experience in C++ programming

**To apply please send me an email with:**

- Why are you interested in this project? What would you like to achieve?
- What is your experience relevant to this project? This could be past projects, past courses; theoretical knowledge or practical experience, related to constrained optimization, planning and/or robotics.
- When would you like to start and which courses will you have left by then?
- Is your motivation to do algorithmic work or applied research?
- Your transcript of record with past courses.
- Available day/times to meet within one/two weeks.

**References:**

- [1] A. Bircher, M. Kamel, K. Alexis, M. Burri, P. Oettershagen, S. Omari, T. Mantel, and R. Siegwart, "Three-dimensional coverage path planning via viewpoint resampling and tour optimization for aerial robots," *Auton. Robot.*, vol. 40, no. 6, pp. 1059–1078, 2015.
- [1] G. A. Hollinger and G. S. Sukhatme, "Sampling-based robotic information gathering algorithms," *The International Journal of Robotics Research*, vol. 33, no. 9, pp. 1271–1287, Aug. 2014.

You may also propose your own project.