

**Offer type:** Internship.

**Region:** Hauts-de-France.

**Département:** Nord.

**Location:** Villeneuve d'Ascq.

**Research Center:** Inria Lille-Nord Europe <https://www.inria.fr/en/centre/lille>.

**Research Team:** INOCS <https://team.inria.fr/inocs/>.

**Duration/Period:** 10 to 20 weeks/starting from March 2017.

**Presentation of INOCS team:** INOCS team is an Inria team and aims to develop new models, algorithmic techniques and implementations for problems with complex structure according to three types of optimization paradigms: mathematical optimization, bilevel optimization and robust/stochastic optimization.

**Internship title:** Models and algorithms for the computation of robot trajectories under connectivity constraints.

**Context:** Routing a fleet of robots in a known surface is a complex problem. It consists in the determination of the exact trajectory each robot has to follow to collect information. The objective is to maximize the exploration of the given surface. To ensure that the robots can execute the mission in a collaborative manner, connectivity constraints are considered. These constraints guarantee that robots can communicate among each other and share the collected information. Moreover, the trajectories of the robots need to respect autonomy constraints: robots are equipped with a battery and its life-time needs to be taken into account.

Applications of this problem can be found in the space scattered sensor visit problems for data collection and/or power up purposes. Robots can be used to restock particular resources to precise locations as, for instance, water in emergency areas or informations to soldiers in war zones [1]. Again, robots can be used to explore dangerous zones as minefields.

**Objectives of the internship:** The two main objectives of the internship are as follows. First, to propose new and effective mathematical formulations for the problem, second, to design competitive algorithms in order to provide optimised trajectories in a reasonable amount of computation time. Analysis and validation of the results may be required.

**Required knowledges:** Basics in linear and integer programming. Good implementation skills in an object-oriented programming language (C++, Java).

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## References

- [1] Karen Miranda, Nathalie Mitton, Tahiry Razafindralambo. On the Impact of Routers' Controlled Mobility in Self-Deployable Networks. The Seventh International Conference on Adaptive and Self-Adaptive Systems and Applications - ADAPTIVE, Mar 2015, Nice, France. 2015.