Post-doctoral fellowship

Development of a Drone-based Atmospheric Sampling System

Research Center: ENERGY AND ENVIRONNEMENT

Affiliation: Ecole Nationale Supérieure Mines-Télécom Lille Douai (IMT Lille Douai)

<u>**Context:**</u> Created by the merger of Mines Douai and Telecom Lille on January 1st, 2017, **IMT Lille Douai** is the largest graduate school of engineering in the north of Paris. It aims at teaching the general engineers and digital experts of the future. Located at the crossroads of Europe, between Paris, London, Brussels and Amsterdam, IMT Lille Douai intends to become a major player in industrial and digital transformation of the society by combining engineering science and digital technologies.

Based on two sites dedicated to research and education in Douai and Lille, IMT Lille Douai has research facilities of almost 20,000m² devoted to high-level scientific activities in the following areas:

- Digital science,
- Energy and Environment,
- Materials and Process engineering applied to polymers, composites and civil engineering.

The Energy and Environment center and the Digital System center join their effort in a common project to use drones for atmospheric measurements. The long-term vision of this project consists in building a robust multi-drones fleet to autonomously map atmospheric volumes using our own specific sampling techniques.

<u>**Scientific project:**</u> Drone technology still faces scientific and technical challenges: autonomous systems and multi-drone coordination, which are a requirement for simultaneous sampling at several locations. On the one hand, the solution needs to produce contextual data from atmospheric observations in order to characterize them in space and time. On the other hand, the sensor system needs to be controlled during the flight to trigger sampling in specific configurations. Those challenges require accurate localization techniques and communication (operator drone/ drone-drone) solutions that are compliant with constrains of aerial systems.

The main task for the post-doc consists in developing a software architecture of the drone platform: both with real drones and through simulations. Further responsibilities will consist of overseeing drone characterization for atmospheric sampling, as well as development of remote control of an atmospheric sampling system.

Objectives:

The main topics of this post-doc are as follows:

1- Participate to the design of the sampling nacelle to mount the sampling system on a drone.
2- Develop a control solution of sampling system.
3- Propose and develop a ROS-based software architecture for scheduling an autonomous drone mission: planned trajectory, data acquisition strategy and so forth.
4- Validate system design through simulations and real experiments.
5- Propose and develop tools to post-process and visualize data from the mission flight.
6- Deploy the measurement system in a measurement campaign to take place in summer 2021.

The researcher will also be expected to participate in teaching activities according to his/her background.

Candidate profile, personal skills, and requirements:

The candidate should hold a PhD preferably in a relevant area of computing sciences and robotics. The expected skills are:

- Robot supervision
- Distributed robot architecture (drone/base - multidrone)
- Measurement cartography

Previous experience with drone control, ROS and on-board system development will be assets for this position. Applicants are invited to send their Curriculum Vitae, a cover letter, and reference letters before July 10.

Further information:

- Full-time postdoctoral position

- Duration: 12 months

- Starting date: from September 2020

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