Offer #2024-07627

Post-Doctoral Research Visit F/M Drone-based adapted agricultural data collection in rural environment.

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : From 5 to 12 years

About the research centre or Inria department

The Inria University of Lille centre, created in 2008, employs 360 people including 305 scientists in 15 research teams. Recognised for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria University of Lille centre pursues a close relationship with large companies and SMEs. By promoting synergies between researchers and industrialists, Inria participates in the transfer of skills and expertise in digital technologies and provides access to the best European and international research for the benefit of innovation and companies, particularly in the region.

For more than 10 years, the Inria University of Lille centre has been located at the heart of Lille's university and scientific ecosystem, as well as at the heart of Frenchtech, with a technology showroom based on Avenue de Bretagne in Lille, on the EuraTechnologies site of economic excellence dedicated to information and communication technologies (ICT).

Context

The OCOD ANR project, coordinated by INRAe and gathering Inria, University of Franche Comté and University of Clermont Ferrand aims to design and deploy a full wireless sensor network based system to sense, collect and assist different crop production in remote and hostile envrionenment. The system will be composed of a smart wireless sensor network to sense and collect efficiently the data. In rural remote regions, even with such a distributed wireless sensor networks, when the network is too sparse, there might have no end-to-end connectivity between the sensors and the central entity that needs to process data. An alternative way to collect data is thus to collect them from the air with the support of UAV (Unmanned Aerial Vehicles).

This project aims to investigate a new generation of data collection, combining intelligent wireless sensors and aerial means, and test this approach in agriculture, in particular in the test farm of INRAe in Auvergne. The main objective is to use unmanned aerial vehicles (commonly called "drone") as data mules to collect data from connected objects on the ground, in natural environments. This aerial solution will facilitate collections in hard-to-access natural environments, which can also suffer from signal attenuation with traditional communication networks. In this context, drones offer a large geographical zone of intervention, and are easier to deploy than land-based mobile vectors (e.g. ground vehicles). Compared to traditional sensor networks, this approach greatly lightens the hardware infrastructure to deploy, by avoiding the installation of numerous gateways to route information from the sensor nodes; gateways are expensive, energy intensive and require regular maintenance, which is incompatible with their presence in an uneasily accessible natural environment.

In some cases, it is not possible for the drone to visit each terrestrial node, either for ground typology, energy efficiency (at the drone or at the ground wireless network level) or because of unexpected events?

The main objective of this project will be to design a dynamic multi hop data routing transmission able to dynamically convey data through the terrestrial sensor nodes towards a specific sink node that will be visited by the drone. This routing must take into consideration hardware and energy constraints by integrating for instance the capacity of the path to reduce data amount and be flexible enough to determine the best appropriate sink node.

Assignment

Within the OCOD project, the candidate will be in charge in the design and implementation of the drone-based adapted agricultural data collection for rural environment. He/she will participate to the OCOD project dynamic. He/She will also have to participate to the FUN team life.

Main activities

The candidate will work jointly with INRAe and other project partners in order to learn about specificities of each crop that could be exploited. Collaborations could be extended with the Sencrop company with which the FUN team collaborate.
All results will be validated experimentally, first on our lab testbed and then in real fields, both teams owning drones and wireless devices.

Timeline:

T0-T3: Review of adequate combined adapted routing and drone-assisted data collection

T4-T10: Investigation of a dynamic collect point selection integrating specificities of agricultural data

T0-T10: Handling of hardware and software already developed in both teams (parallel task)

T10-T15: Integration of dynamic collect point selection in a dynamic path planning approach for drones, implementation and validation

Skills

We demand the candidate:

- 1) to be curious and interested in new technologies
- 2) to have excellent skills in scripting and programming (e.g., python, C/C++, Java, ROS)
- 3) to have a strong background in mobile networks, Wireless and Mobile Networks.
- 4) to be fluent in spoken and written English with strong communication and presentation skills.
- 5) to be a pleasant team worker (verbal communication, active listening, motivation and commitment)

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

2788 € monthly gross salary

General Information

- **Theme/Domain :** Networks and Telecommunications
  System & Networks (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** Centre Inria de l'Université de Lille
- **Starting date :** 2025-11-01
- **Duration of contract :** 12 months
- **Deadline to apply :** 2025-08-04

Contacts

- **Inria Team :** FUN
- **Recruiter :**
  Mitton Nathalie / Nathalie.Mitton@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

We are looking for a candidate that has a PhD in computer science who is creative in proposing solution solutions and capable of critical analysis of results.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Please send your CV and cover letter

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.