2020-03198 - Building a 1,000 Robot Swarm Testbed

**Type de contrat :** CDD  
**Niveau de diplôme exigé :** Bac + 3 ou équivalent  
**Fonction :** Stagiaire de la recherche  
**Niveau d’expérience souhaité :** Jusqu’à 3 ans

**Contexte et atouts du poste**

**Environment**

You will work in a fantastically fun environment, within the EVA team (https://team.inria.fr/eva/), but also in constant collaboration other international research teams, in particular Prof. Pister’s team at UC Berkeley.

EVA (https://team.inria.fr/eva/) is a leading research team in low-power wireless communications. The research team is designing Tomorrow’s Internet of (Important) Things. The team pushes the limits of low-power wireless mesh networking by applying them to critical applications such as robotics, industrial control loops, with harsh reliability, scalability, security and energy constraints. EVA co-chairs the IETF 6TiSCH standardization working group and co-leads Berkeley’s OpenWSN project. EVA is heavily involved in real-world applications, and oversees over 1,000 sensors deployed on 3 continents for smart agriculture, smart city and environmental monitoring applications. The team is associated with Prof. Pister’s team at UC Berkeley, working on micro-robotics.

Some pointers about the projects the EVA team is involved in:

- Team Homepage: https://team.inria.fr/eva/  
- Thomas Watteyne’s homepage: thomaswatteyne.com  
- mm-scale micro-electronics: http://www.crystalfree.org/  
- Falco spin-off startup company: https://www.wefalco.com/  
- Smart Agriculture deployment in Argentina: http://www.savethepeaches.com/  
- Environmental deployment in California: http://snowhow.io/  
- Smart city deployment in the French Riviera: http://smartmarina.org/  
- open-source 6TiSCH implementation: openwsn.org

Get a glimpse at what we do in the EVA team

All videos at https://twatteyne.wordpress.com/videos/

**Working at Inria**

Established in 1967, Inria is the only public research body fully dedicated to computational science in France. Combining computer science with mathematics, Inria’s 3,500 researchers strive to invent the digital technologies of the future. Inria researchers creatively integrate basic research with applied research and dedicate themselves to solving real problems, collaborating with the main stakeholders in public and private research in France and abroad, and transferring results to innovative companies. Inria researchers have published over 4,500 articles in 2013 and are behind over 270 active patents and 110 start-up companies. In 2013, Inria’s budget was 235 million euros, 25% of which represented its own resources. The 180 project teams are distributed in eight research centers located throughout France.

The Inria-Paris research center is located in the heart of Paris. Thanks to its top-quality researchers and numerous international guests, the Inria-Paris
Large, coordinated “swarms” of small, resource-constrained robots have the potential to coordinate to complete complex tasks that single monolithic robots cannot. We are designing a robotic platform called “DotBot”, a low-cost, versatile laser-cut robot that can inexpensively act as an agent in a swarm of robots (picture of an early prototype on the right). Each DotBot has two small motors for mobility, accurate localization using laser lighthouses, and can communicate using off-the-shelf radios in either time-synchronized channel-hopping mesh networks originally designed for reliable transmission in crowded IoT networks, or with BLE so that the robots can be programmed from a cell phone or other Bluetooth-enabled device.

The goal of this internship is to turn the design of the DotBot (which we expect to be final by the time you start the internship) into a 1,000-robot testbed. By “testbed”, we mean the robots themselves, but also the hardware and software infrastructure for researcher to be able to use the robots for carrying out experiments: remote control the robots, reprogram the robots, recharge the robots, etc. If you like embedded systems and robotics and you like building things, this is the dream internship for you.

You will be at the heart of the vibrant Inria-EVA team, and will receive lots of help if there are tasks you don’t know how to carry out (which is normal from an intern!). Thomas Watteyne, the team lead, will be your mentor. You will be interacting with many other members of the Inria-EVA team, including Said Alvarado (research engineer who leads the design of the DotBot), Trifun Savic (doing a PhD on how to localize the robots), Razanne Abu-Aisheh (doing a PhD on algorithms for robotic swarms), Fil Maksimoniv (Researcher working on micro-robotics) and others. You will attend weekly calls with Prof. Pister’s team at UC Berkeley, co-designers of the micro-robotic platforms. There will be 2-3 additional interns (working on gateways, localization and low-power wireless systems), during your stay at Inria EVA, so you will not be the only intern.

At the end of your internship, you will have made a major contribution by having put together a key test infrastructure used by the Inria-EVA team, UC Berkeley’s Pister team, and beyond. We expect this testbed to be used intensively for the following 3-5 years. On the technical side, you will have worked with embedded programming, robot mechanics, Python-based automation. Maybe more importantly, you will have developed a “system” view – looking at the full system and putting it all together -- and have worked following state-of-the-art code development tools and practices. From a scientific point of view, you will be invited to lead a scientific publication, which will be submitted, to either a conference or a journal.

**Principales activités**
see above.

**Compétences**

**Skills and Expertise**

We are looking for a student pursing a Masters of Engineering (“ingénieur”) or Masters of Science (MSc, “Master”) diploma, typically in your 4 th year of studies.

- good “hard” skills
  - some embedded programming experience (understanding an electronic schematic, programming micro-controllers)
  - some experience with robotics, as a designer or a user.
  - “computer” programming skills (ideally Python), including some web development (understanding how browser and server communicate, JavaScript visualization)
  - some understanding of software quality and project management tools (e.g. Git, GitHub, Travis-CI, Jenkins)
- good “soft” skills
  - we are looking for the “technical leader” type. If you have participated in open-source projects, have lead a software development team, tell us about it!
  - ideally, some open-source project experience, including source code and project management tools (Git, GitHub, Travis-CI, etc)

**Languages**

Communication within the team happens mostly in English, so speaking English is important. Speaking French is not a requirement, but a plus.

**Avantages**

Located at the heart of Europe, Paris is a unique place to work and live in. Inria offers a unique balance between working in a leading research center, and living in one of the most beautiful and bustling cities in the world. A real communication hub, Paris is a gateway to France and Western Europe, and working in the Inria-Paris research center is real asset to your career. Inria Paris is located at walking distance from Paris Gare de Lyon.
Informations générales

- **Thème/Domaine** : Robotique et environnements intelligents
  Instrumentation et expérimentation (BAP C)
- **Ville** : Paris
- **Centre Inria** : CRI de Paris
- **Date de prise de fonction souhaitée** : 2021-03-01
- **Durée de contrat** : 6 mois
- **Date limite pour postuler** : 2021-01-31

Contacts

- **Equipe Inria** : EVA
- **Recruteur** :
  Watteyne Thomas / thomas.watteyne@inria.fr

A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

L'essentiel pour réussir

Consignes pour postuler

**How to Apply**

To apply, either use this website, or send your CV and cover letter to thomas.watteyne@inria.fr with the subject “Robot Swarm Internship application”. Don't hesitate to ask clarifying questions before applying.

Evaluation of applications begin now and continue until the position is filled. **Candidates are encouraged to apply now.**

**Sécurité défense :**

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

**Politique de recrutement :**

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

**Attention** : Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.