Offer #2023-05742

Post-Doctoral Research Visit F/M Multi-sensor and Artificial Intelligence for the Factory of the Future

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : Recently graduated

About the research centre or Inria department

The Inria Université Côte d'Azur center counts 36 research teams as well as 7 support departments. The center's staff (about 500 people including 320 Inria employees) is made up of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrative staff. 1/3 of the staff are civil servants, the others are contractual agents. The majority of the center's research teams are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Four teams are based in Montpellier and two teams are hosted in Bologna in Italy and Athens. The Center is a founding member of Université Côte d'Azur and partner of the I-site MUSE supported by the University of Montpellier.

Context

ACENTAURI is a robotics team led by Ezio MALIS that studies and develops autonomous and intelligent robots that collaborate with each other to perform challenging tasks in complex and dynamic environments. The team addresses perception, decision, and control problems for multi-robot collaboration by proposing a novel hybrid model- and data-driven approach to artificial intelligence. TITANE is a team led by Pierre ALLIEZ that studies 3D geometric modeling and digital processing of geometry. The team designs algorithms and geometric data structures, notably for shape reconstruction, shape approximation, mesh generation and algorithmic components used for the digital twin.

The context is the factory of the future for Naval Group, which manufactures frigates and surface ships. The input is a digital model of the ship, the equipment assembly schedule and measurement data (images or Lidar). We seek to monitor the assembly process by comparing the "as-designed" models with the "as-built" models. Using sensor-based intelligence based on videos and laser scanned 3D point clouds, we seek to follow the progress of a real project and to verify its conformity with a digital twin. This requires fusing the vision and laser data, and devising algorithms for 3D object detection and metrology.

Assignment

The goal of this 24-month postdoc is to automate monitoring, with sensor-based intelligence to validate the factory activities. Fixed or mobile sensor systems are planned (cameras and laser scanners).

The first problem to be studied is the placement of the sensors which must cover the whole area to be monitored. The second problem is that there are differences between the parts designed in CAD and those assembled. In addition, the "as-designed" model may overlap with the "as-built" model, and equipment may appear late. The equipment of the construction site can mask the perception of reality. The required accuracy must be sufficient to validate the presence and valid mounting of equipment. The detection of assembly errors will be performed by comparing the geometric model with the reality reconstructed in 3D from Lidar point clouds or by photogrammetry, or by using images from the camera. Machine learning approaches will be used to correlate the acquired images with the digital mockup projected onto the images. The full-scale experiments will take place on Naval Group's construction sites in Lorient. Travel will be required for system development, data acquisition and demonstrations.

Main activities

- Bibliographical study on multi-sensor 3D reconstruction (LiDAR and vision) and CAD model / reconstructed model registration.
- Test on data provided by Naval Group.
- Study and implementation of an approach using a multi-sensor system (a LiDAR and a stereo camera) mounted on a tripod.
- Study of the contribution of a machine learning approach.
- Test on data acquired by our multi-sensor system on Naval Group's construction sites.
- Comparison with state-of-the-art techniques.
- Final validation on Naval Group's construction sites.
- Writing of documentation, reports and articles for international conferences and journals.

Skills

The candidate should preferably have a PhD in signal processing or applied mathematics. The candidate should have a strong background in software development (Matlab, C/C ++, Python, Git, ...). He/she should also be highly motivated for multidisciplinary studies and all aspects of research ranging from fundamental to experimental work. Finally, a good level in English read/written/spoken is important.

Benefits package

- Subsidized catering
- Public transportation partially reimbursed
- Vacations: 7 weeks of annual leave + 10 days of absence (full-time basis) + possibility of exceptional leaves of absence (e.g.: sick children, moving)
- Possibility of telecommuting (after 6 months of seniority) and flexible working hours
- Professional equipment available (videoconferencing, etc.)
- Social, cultural and sports benefits (Inria's social works management association)
- Access to professional training
- Social security

Remuneration

Gross Salary: 2746 € per month

General Information

- **Theme/Domain :** Data and Knowledge Representation and Processing
  Scientific computing (BAP E)
- **Town/city :** Sophia Antipolis
- **Inria Center :** Centre Inria d'Université Côte d'Azur
- **Starting date :** 2023-04-01
- **Duration of contract :** 2 years
- **Deadline to apply :** 2023-07-31

Contacts

- **Inria Team :** ACENTAURI
- **Recruiter :**
  Malis Ezio / Ezio.Malis@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.

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

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.