



Offre n°2024-07436

PhD Position F/M Robotics Whole-Body Planning, Control, and Learning for Loco-Manipulation Actions

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

Niveau d'expérience souhaité : Recently graduated

Contexte et atouts du poste

LARSEN is a robotics team, located in Inria Nancy / Loria, that develops human-centered technologies, at the frontier between humanoid robotics, control, learning, and interaction with humans.

The team develops learning and control algorithms for teleoperated / semi- / autonomous robots, where mobile manipulators and humanoids are involved in complex manipulation tasks in a remote location to replace humans. The team is also developing advanced humanoid robotics control and learning techniques to enable human-humanoid collaboration.

The laboratory has state-of-the-art robotics equipment: 2 full body humanoid robots (Talos and iCub), 3 Franka manipulators, drones of different sizes, 2 Xsens motion capture sensorized suits, passive and active exoskeletons, 6 AMTI force plates, 3 experimental rooms with motion capture (Qualisys, Vicon), several wearable sensors (EMG Delsys, force sensors, EKG, etc.). The laboratory has a 3D printing facility and a mechatronic workshop for prototyping and maintenance.

The team consists of many research scientists, postdocs, PhD and has the support of 1 software and 1 mechatronics engineer. The team is international - English and French speaking. French is not required, although free French classes are available in the institute for non-French speakers.

The laboratory is located in the Science and Technology Campus of the University of Lorraine, next to the Botanical Gardens, at 20 minutes by public transportation or bike from the Nancy train station and City Center. Nancy is a University town, with a high quality of life and a vibrant student and expat community.

Mission confiée

Fully-funded PhD position in the field of Robotics, focusing on Whole-Body Planning, Control, and Learning for Loco-Manipulation Actions. The successful candidate will join our dynamic research team and contribute to cutting-edge advancements in robotics.

Project Description:

The Ph.D. Thesis aims to develop innovative methodologies and algorithms exploiting model-based optimization, optimal control, and learning for whole-body planning and control in generic multi-limbed robotic systems interacting with the environment, with a particular focus on agile and dynamic locomotion and manipulation actions.

The research will address the challenges associated with agile and heavy loco-manipulation tasks, such as motion and contact planning and control. The goal is to enable robots to perform complex locomotion and manipulation tasks in unstructured and dynamic environments, with applications ranging from industrial automation to service robotics.

The student will have the opportunity to perform the research using laboratory robotic assets including the omniTiago++ robot and the humanoid bipedal robot TALOS.

Principales activités

- Review literature on model-based optimization and learning algorithms for whole-body planning and control in robotic systems.
- Familiarize oneself with existing methodologies and algorithms used in locomotion and manipulation tasks.
- Develop a theoretical framework for integrating model-based optimization and learning techniques for agile loco-manipulation.

- Design and implement algorithms for motion planning in contact-rich environments, considering dynamic stability constraints.
- Validate the developed methodologies and algorithms through simulations using software platforms such as ROS (Robot Operating System).
- Conduct experiments with laboratory assets, including the omniTiago++ robot and the humanoid bipedal robot TALOS, to test the effectiveness of the proposed approaches.
- Analyze experimental results and iterate on the developed methodologies to improve performance and robustness.
- Document research findings in academic papers and present them at conferences and workshops.
- Collaborate with other researchers and engineers to integrate the developed algorithms into practical robotic systems.
- Explore potential applications of the developed methodologies and algorithms in industrial automation and service robotics domains.

Compétences

Good to have:

- Experience with real robots.
- Proficiency in programming languages such as C/C++ and Python.
- Ability to work independently and as part of a team.
- Good communication and writing skills.

Preferred Qualifications:

- Experience with whole-body control, optimal control, optimization techniques, and reinforcement learning.
- Familiarity with robotic platforms and simulation environments (eg, ROS2, Gazebo, MuJoCo, CasADi, Eigen, Pinocchio, Nvidia Isaac GYM).

Avantages

- 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 (after 6 months of employment) 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

Rémunération

2100 € gross/month the 1st year

Informations générales

- **Thème/Domaine** : Robotics and Smart environments
Software Experimental platforms (BAP E)
- **Ville** : Villers lès Nancy
- **Centre Inria** : [Centre Inria de l'Université de Lorraine](#)
- **Date de prise de fonction souhaitée** : 2024-10-01
- **Durée de contrat** : 3 years
- **Date limite pour postuler** : 2024-04-30

Contacts

- **Équipe Inria** : [LARSEN](#)
- **Directeur de thèse** :
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A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 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 200 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

Master's degree (or equivalent) in Robotics, AI, Computer Science, Electrical Engineering, Mechanical Engineering, or a related field.

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.

Consignes pour postuler

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.