



Offre n°2025-08723

PhD Position F/M Advancing Grasp for people with upper limb paralysis: a shared control approach between the user and the assistive device

Type de contrat : Fixed-term contract

Niveau de diplôme exigé : Graduate degree or equivalent

Fonction : PhD Position

Niveau d'expérience souhaité : From 3 to 5 years

A propos du centre ou de la direction fonctionnelle

Inria is a national research institute dedicated to digital sciences that promotes scientific excellence and transfer. Inria employs 2,400 collaborators organised in research project teams, usually in collaboration with its academic partners. This agility allows its scientists, from the best universities in the world, to meet the challenges of computer science and mathematics, either through multidisciplinary or with industrial partners.

A precursor to the creation of Deep Tech companies, Inria has also supported the creation of more than 150 start-ups from its research teams. Inria effectively faces the challenges of the digital transformation of science, society and the economy

Contexte et atouts du poste

The researcher will be part of the CAMIN team at INRIA Montpellier.

The position will be funded by INRIA under the national PEPR O2R PI3

"ASSISTMOV"

The integrated project PI3 "ASSISTMOV," composed of a multidisciplinary team of engineers and social sciences and humanities (SSH) researchers, focuses on the use case of assistive robotics for the assisting movement of people with disabilities. Through the development of an upper-limb exoskeleton, this project aims to create a breakthrough technology for smooth and robust interaction with the user.

The proposed PhD follows a previous work of the CAMIN team on the development of an algorithm for estimating the intention to grasp based on observing the approach movements toward an object [1]. Operating within a collaborative grasping control paradigm, the users naturally move their hand towards an object they wish to grasp and the algorithm identifies the target of the movement and selects an appropriate grip for the assistive device to perform (timing and shape of grasp). This approach contrasts with more traditional control paradigm which classically rely on finite state machines [2] controlled by switch buttons [3], myoelectric sensors, inertial measurement units installed on the contralateral shoulder, or even on voice control [4]. Similarly to prosthesis control, such interfaces are associated to an important cognitive load on the user, in addition to lack of fluidity, resulting in sequential motions due to the state machine approach. The motivation of this project is to offer a more intuitive control interface which adapts to the user's behavior without requiring any dedicated or stereotypical action.

After a familiarization with existing materials: publications, algorithms, tools (virtual reality programming, etc.), the objective is to define new objectives to improve on the existing solution and adapt it to the project "ASSITMOV" context. One of the important objectives will be to improve the usability of the solution. Among the limiting aspects of the existing algorithm is that it uses a predefined set of objects (YCB dataset). The PhD student will work on a new generic approach that allows interaction with any everyday objects. Another significant limitation of the current approach to hand motion analysis is the bias of existing tools, which are primarily trained on data from able-bodied individuals [5]. Our goal is to propose a neural architecture capable of extracting and analyzing the hand kinematics of individuals with physical disabilities. This involves creating a dataset of atypical hand movements to train new networks.

The developed framework will be experimentally tested on able-bodied participants and people with upper-limb paralysis, in two use cases requiring several practical implementations:

- virtual reality to evaluate the interaction of the user with the control algorithm
- computer vision for real-world interaction with everyday-life objects

[1] Moullet, E., Carpentier, J., **Azevedo-Coste, C., & Bailly, F.** (2024). I-GRIP, a Grasping Movement Intention Estimator for Intuitive Control of Assistive Devices. In 2024 IEEE-RAS 23rd International Conference on Humanoid Robots (Humanoids) (pp. 957-964). IEEE.

[2] Light, C. M., Chappell, P. H., Hudgins, B., & Engelhart, K. (2002). Intelligent multifunction myoelectric control of hand prostheses. *Journal of medical engineering & technology*, 26(4), 139-146.

[3] Trotobas, C., Ferreira, F. M. R. M., de Faria Moraes, M. R., Valladao, A. M., Martins, H. R., Fattal, C., & **Azevedo Coste, C. A.** (2024). Combining Functional Electrical Stimulation (FES) to Elicit Hand Movements and a Mechanical Orthosis to Passively Maintain Wrist and Fingers Position in Individuals With Tetraplegia: A Feasibility Test. *IEEE Transactions on Medical Robotics and Bionics*.

[4] Tigra, W., Navarro, B., Cherubini, A., Gorron, X., Gelis, A., Fattal, C., ... & **Azevedo Coste, C. A.** (2016). A novel EMG interface for individuals with tetraplegia to pilot robot hand grasping. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 26(2), 291-298

[5] Zhang, F., Bazarevsky, V., Vakunov, A., Tkachenka, A., Sung, G., Chang, C. L., & Grundmann, M. (2020). Mediapipe hands: On-device real-time hand tracking. *arXiv preprint arXiv:2006.10214*.

Mission confiée

Collaboration :

The recruited person will be in connection with the with SHS researchers and Approche associations, partners of the PEPR PI3 consortium.

Principales activités

Main activities:

- Literature review on assistive robotic grasping and shared control
- Implementation of a shared control algorithm included in a VR environment
- Participation in experimentation with healthy participants and people with upper limb paralyses
- Dissemination of results (publications and scientific communications, interactions with the national PEPR team)

Avantages

- Subsidized meals
- 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 (few days per week) 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
- Contribution to mutual insurance (subject to conditions)

Rémunération

Gross Salary:

1st year : 2200 € per month

2nd and 3rd year : 2300 € per month

Informations générales

- **Thème/Domaine** : Modeling and Control for Life Sciences Instrumentation et expérimentation (BAP C)
- **Ville** : Montpellier
- **Centre Inria** : [Centre Inria d'Université Côte d'Azur](#)
- **Date de prise de fonction souhaitée** : 2025-10-01
- **Durée de contrat** : 3 years
- **Date limite pour postuler** : 2025-06-13

Contacts

- **Équipe Inria** : [CAMIN](#)
- **Directeur de thèse** :
Bailly François / francois.bailly@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 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

Excellent programming skills :

- Python, C, C++
- Linux, Windows
- Unity, Unreal engine
- CMAKE

Good communication skills :

- Team work
- Written and oral skills in English and French

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.