Offer #2025-08914

Post-Doctoral Research Visit F/M Discretisation of Homogeneous Sliding Mode Controllers for Infinite Dimensional Systems

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : Up to 3 years

About the research centre or Inria department

Created in 2008, the Inria center at the University of Lille employs 360 people, including 305 scientists in 15 research teams. Recognized for its strong involvement in the socio-economic development of the Hauts-De-France region, the Inria center at the University of Lille maintains a close relationship with large companies and SMEs. By fostering synergies between researchers and industry, Inria contributes to the transfer of skills and expertise in the field of digital technologies, and provides access to the best of European and international research for the benefit of innovation and businesses, particularly in the region.

For over 10 years, the Inria center at the University of Lille has been 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

This postoctoral research is within the framework of a partnership of the project ANR SLIMDISC dedicated to disctization of sliding mode controllers for infinite dimensional control systems.

Assignment

Assignments :
With the help of Andrey Polyakov, the recruited person will be taken to develop discretization algorithms of homogeneous sliding mode controllers for various infinite dimensional control system.

For a better knowledge of the proposed research subject :

- A. Polyakov, Generalized Homogeneity in Systems and Control, Second Edition, Springer, 2025
- A. Polyakov, D. Efimov, X. Ping, Consistent discretization of homogeneous finite/fixed-time controllers for LTI systems, Automatica, 2023
- B. Brogliato, A. Polyakov, Digital implementation of sliding?mode control via the implicit method: A tutorial, International Journal of Robust and Nonlinear Control, 2021
- A. Polyakov, D. Efimov, B. Brogliation, Consistent Discretization of Finite-time and Fixed-time Stable Systems, SIAM Journal on Control and Optimization, 2019

Collaboration :
The recruited person will be in connection with partners of ANR SLIMDISC (Inria Grenoble and CNRS L2N, Nantes).

Responsibilities :
The person recruited is responsible for theoretical developments of discretization algorithm and thier implementation in MATLAB. Well-developed and well-implemented algorithms may be included in Homogeneous Control Systems Toolbox for MATLAB (https://chercheurs.lille.inria.fr/~polyakov/hcs/index.html)

Main activities

Main activities:

- development of discretization algorithms for sliding mode controllers
- theoretical justification of results
- implementation of discretization algorithms in MATLAB (and/or Python)

- writing reseach papers
- presentation of results at conferences and project meetings

Additional activities:

- experimental validation of results

Skills

Technical skills and level required :

- PhD in Control Theory (or in Applied Mathematics) is necessary
- good knowledge of infinite dimensional control systems (e.g., control of PDE models) is necessary
- good knowledge of MATLAB (or Python) is necessary
- a knowledge of conventional methods of discretization of continuous-time systems (e.g., ODEs and PDEs) is welcome
- a knowledge of homogeneous and/or sliding mode control systems is welcome
- an experience of practical control applications is welcome

Languages :

- good oral and writing English is necessary
- a knowledge of French is not required but welcome

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

Gross salary by month : 2788€

General Information

- **Theme/Domain :** Optimization and control of dynamic systems
  Software engineering (BAP E)
- **Town/city :** Villeneuve d'Ascq
- **Inria Center :** Centre Inria de l'Université de Lille
- **Starting date :** 2025-12-01
- **Duration of contract :** 1 year, 6 months
- **Deadline to apply :** 2025-06-30

Contacts

- **Inria Team :** VALSE
- **Recruiter :**
  Polyakov Andrey / Andrey.Polyakov@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

An applicant should have a solid background in mathematical control theory or in applied mathematics. A basic knowledge of infinite dimensional systems (e.g., PDEs) is necessary. Good programming skills in MATLAB or Python are required too. A knowledge of numerical methods for discretization of continous-time finite/infinite dimensional systems (e.g., ODEs and PDEs) is welcome. A basic knowledge of sliding mode and/or homogeneous control systems is welcome as well. In the case of absence of the latter knowledges, the applicant must be ready to learn them in a rather short time in order to complete sucessfully all research tasks.

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

CV + 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.