

# Finite-time stability and stabilization of interconnected systems

Type d'offre : **Doctorant**

Lieu de travail : **Lille (Villeneuve d'Ascq)**

Thème de recherche : **Mathématiques appliquées, Automatique, Calcul et simulation**

Projet : **NON-A**

Responsable scientifique : **wilfrid.perruquetti@inria.fr**

## A propos d'Inria et du poste

Inria is a research institute dedicated to promoting 'scientific excellence in the service of technology transfer and society as a whole'. Inria employs a staff of 2700, drawn from the world's most prestigious universities, to address the latest challenges in computer science and mathematics. The Institute operates eight Research Centres throughout France. The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Nord - Pas-de-Calais Region, the Inria Lille - Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

## Mission

The main occupation of the PhD research will be theory development, simulation, papers and reports writing, with industrial transfer of the obtained solutions.

## Descriptif du poste

Systems of Systems (SoS) are composed with interconnected dynamical subsystems with communication facilities, the natures of which lead to different mathematical models (ordinary differential equations, differential inclusions, time delay systems, partial differential equations), and their interconnection leads to emergence of a new structure, which offers more functionality and performance than simply the sum of the constituent subsystems. The need to manage such a SoS with communication facilities, while requiring the best achievable performances, is a new challenge brought to us by the information technology revolution. The proposed PhD project aims at developing a new framework to address control and estimation issues of SoS subject to model diversity, while achieving robustness as well as severe time response constraints. In this project, finite-time stability concepts help in managing severe time constraints, while the homogeneity theory is the main tool for achieving the finite-time property for both convergence and input-to-state stability for each class of systems. The research will focus on interconnection of ODE and PDE models.

## References:

E. Bernuau, A. Polyakov, D. Efimov & W. Perruquetti. Verification of ISS, iISS and IOSS properties applying weighted homogeneity. *Systems & Control Letters* 62:12 (Dec.

2013), 1159–1167.

E. Moulay & W. Perruquetti. Finite time stability conditions for non autonomous continuous systems. *International Journal of Control* 81:5 (2008), 797–803.

W. Perruquetti, T. Floquet & E. Moulay. Finitetime observers: application to secure communication. *IEEE Trans. on Automatic Control* 53(1) (2008), 356–360.

A. Polyakov, D. Efimov & W. Perruquetti. Finite-time and Fixed-Time Stabilization: Implicit Lyapunov Function Method. *Automatica* 51:1 (2015), 332–340.

More publications by the team are available at [http://www.inria.fr/equipes/non-a/\(section\)/publications](http://www.inria.fr/equipes/non-a/(section)/publications)

## Profil recherché

The candidate must have a master degree in Maths with good knowledge of Control and Systems theory or conversely a master in Control and Systems theory with a good mathematical level. Programming and communication skills are required, with a good sense of organization, autonomy and rigor. Virtuous knowledge of English is mandatory.

## Avantages

- Possibility of French courses
- Help for housing
- Participation in transports costs
- Scientific Resident card and help for visa if necessary
- Possibility of restoration on site

## Informations complémentaires

Duration : 36 months

Starting date of the contract : [1st October/November 2017](#)

Salary : approx 2000€ gross/month.

Scientific contact : To applying, please contact the scientific advisors:

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