2018-00550 - Compilation techniques and programming methodologies using controller synthesis - Post-Doctorant Inria Grenoble Research center

Contract type : Public service fixed-term contract
Level of qualifications required : PhD or equivalent
Function : Post-Doctoral Research Visit

About the research centre or Inria department
Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 35 research teams and 9 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

Context
Ce sujet de post-doctorat est proposé par Gwenaël Delaval, dans l'équipe Ctrl-A, équipe commune entre le Lig (Laboratoire d'Informatique de Grenoble) et l’Inria, à Grenoble.

Assignment
The context of our work is Autonomic Computing, considering that systems, from small embedded systems to large-scale HPC or cloud infrastructures, are more and more self-adaptive and reconfigurable, for resource management, energy efficiency, or by functionality. The Ctrl-A team focuses on methods and tools, combining Computer Science and Control Theory, for the design of safe controllers for runtime decision on whether to reconfigure, and choice of the next configuration. Our main design language and tool is Heptagon/BZR (http://bzr.inria.fr), a reactive language belonging to the synchronous languages family; its compilation involves Discrete Controller Synthesis (DCS).

The post-doctoral work will contribute in extending the Heptagon/BZR language with novel features, in order to consolidate its usability as well as enabling implementations of the controllers on distributed execution architectures. One axis will focus on programming and modelling methodologies, in order to obtain logical (Boolean) or numerical abstractions which can improve the use of discrete controller synthesis. This is needed for example, in order to program the controllers for systems where the useful data for control can be of arbitrary types (integer, real, ...) , or also for systems which are naturally distributed, and require a decentralized controller. Another axis will focus on the problem of diagnosis of Heptagon/BZR programs, which is made special by the fact that discrete controller synthesis can find a solution when it exists, but it is not easy to precisely diagnose cases where no solution can be found. Additionally, approaches will be explored for the integration in the language of mechanisms of adaptive discrete control, where the controller itself can be reconfigured at runtime, in order to enforce different objectives, or to accomodate changes in the controlled system or environment.

Bibliography :
- G. Delaval, S. M.-K. Gueye and E. Rutten. Distributed Execution of Modular Discrete Controllers for Data Center Management. 5th IFAC international workshop on Dependable Control of Discrete Systems (DCDS’15), 2015, Cancun, Mexico.

A more detailed presentation of the post-doc is visible there: https://team.inria.fr/ctrl-a/job-offers/

Main activities
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General Information
- Theme/Domain : Distributed Systems and middleware
- Scientific computing (BAP E)
- Town/city : Montbonnot
- Inria Center : CRI Grenoble - Rhône-Alpes
- Starting date : 2018-11-01
- Duration of contract : 1 year, 4 months
- Deadline to apply : 2018-04-04

Contacts
- Inria Team : CTRL-A
- Recruiter : Delaval Gwenaël / gwenael.delaval@inria.fr

Conditions for application
Starting date : 1st November 2018, duration: 16 months.

Applicants should hold a PhD (defended between 1st September 2016 and 31st October 2018) in Systems and Control or Applied Mathematics.

Applications have to be made on-line on the Inria web site before end of March.
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The post-doc will be supervised by Gwenaël Delaval (Ctrl-A Lig/Inria team).
Contact : gwenael.delaval_at_inria.fr

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.

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.
Skills
The applicant should have good knowledge in:
- semantics, programming languages, compilation
- formal methods for the validation of programs or systems

The applicant should also have good programming skills. Knowledge about programming la

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration
*Gross salary:* 2650 Euros per month