PhD candidate in the area of Simulation-aided Runtime Optimization of Industrial Systems
University of Amsterdam, Faculty of Science – Informatics Institute

The Informatics Institute at the University of Amsterdam invites applications for a fully funded position for a PhD candidate in the area of Simulation-aided Runtime Optimization of Industrial Computing and Control Systems. More specifically, the PhD student will be involved in the iDAPT research project (‘Interactive DSL for Composable EFB Adaptation using Bi-simulation and Extrinsic Coordination’) that is funded by the Dutch Technology Foundation STW and is a cooperation with ASML, the world’s largest supplier in the world of photolithography systems for the semiconductor industry.

The successful candidate will be based in the Computer Systems Architecture group of the System and Network Engineering (SNE) Lab, which is part of the Informatics Institute (IvI) at the University of Amsterdam, the Netherlands. The institute has consistently been ranked among the top 100 computer science departments in the world by the QS World University IT Rankings.

Project description

Large and complex computer systems, especially industrial applications, are usually composites of components designed and built separately. This loose coupling is made possible for functional specifications by means of compositional interfaces, e.g. network protocols, APIs and data structures. However, large systems are operated using specifications beyond functional definitions: system operators expect to be able to manage, i.e. both predict and constrain, extra-functional behavior (EFB) of applications. EFB is a superset of quality-of-service (QoS) metrics like communication throughput or latency, that also includes performance, performance/watt, transient faults, etc. Unfortunately, there exists yet no composable interfaces to EFB management so that component-level EFB rules or models are automatically integrated when composing a whole system, or so that EFB behavior observed at the whole can be decomposed per sub-component. The iDAPT project will explore and develop methods and tools for EFB management aiming to satisfy these requirements. The proposed approach is to co-design and explore a combination of a) a domain-specific language (DSL) to describe EFB constraints per component, with compositional semantics and b) online bi-simulation to predict EFB behavior of a large system ahead-of-time and c) a semi-supervised monitoring and coordination engine that integrates both #a and #b, without being intrusive in the functional design. The proposed methodology will be applicable both bottom-up, i.e. during application implementation, and top-to-bottom, i.e. during high-level design, or during a posteriori analysis or adaptation of existing systems. Three researchers will support this project, including the position corresponding to the present opening.

Tasks

The PhD candidate is expected to:

• research the simulation aspects of the iDAPT project, including empirical evaluations on the industrial use case;
• complete and defend a PhD thesis within the official appointment duration of four years;
• collaborate with other SNE researchers as well as with people from our project partner, ASML;
• regularly present intermediate research results at international conferences and workshops, and publish them in proceedings and journals;
• assist in relevant teaching activities.

Requirements

• M.Sc. in computer science or computer engineering;
• Preferably some prior expertise in one or more of the following fields: system software and software engineering, modeling and/or simulation, performance optimization of networked applications, concurrent programming;
• Candidate should be open to industrial cooperation and should be comfortable with working at ASML in Veldhoven for at least one day per week (depending on the project phase);
• Fluency in oral and written English is required;
• The project has a technical component next to the scientific challenges, so the candidate must not be shy to deliver reusable, self-contained, well-documented software;
• The candidate is expected to display programming proficiency B2 (see http://tinyurl.com/kfxayaq) in a performance language (either C++, Go, ML, Clojure or Rust) by the end of the first year.

More information
Further information can be obtained from Dr. Andy D. Pimentel, Informatics Institute, University of Amsterdam, Science Park 904, 1098 XH, Amsterdam, The Netherlands; tel. +31 20 525 7578; email: a.d.pimentel@uva.nl

Appointment
The appointment will be on a temporary basis for a period of 4 years (initial appointment will be for a period of 18 months and after satisfactory evaluation it can be extended for a total duration of 4 years) and should lead to a dissertation (PhD thesis). An educational plan will be drafted that includes attendance of courses and (international) meetings. The PhD student is also expected to assist in teaching of undergraduates.

Some of the things we have to offer:

• competitive pay and excellent benefits;
• very friendly, interactive and international working environment;
• new building located near the city center (10 minutes by bicycle) of one of Europe’s most beautiful and lively cities;
• access to high-end computing facilities (e.g., cluster with 4,000+ cores).

Job application
Applications should include a letter of motivation, a curriculum vitae, an MSc diploma with transcripts (courses + grades), and the names and contact information of two academic references. Applications can be emailed to a.d.pimentel@uva.nl.

The selection process will consist of multiple rounds, during which (selected) candidates will also be asked to complete a programming challenge.

No agencies please