Expressiveness of Distributed Systems

(Research Internship Offer in Computer Science/Engineering)

Background

We aim to discover which systems can be implemented in a distributed way—and how—using only asynchronous communication between components, while preserving desirable properties that may be specified in terms of synchronous communication. In connection with this, we try to establish an expressiveness hierarchy of specification formalisms with different communication paradigms.

We propose and inventory various definitions of what it means for processes to communicate with each other using only asynchronous communication, and subsequently investigate which processes can be implemented conform these definitions. In deciding whether a given process can be implemented using only asynchronous communication, one needs to choose a semantic equivalence that specifies which aspects of the specified behaviour need to be preserved under implementation. Depending on this choice, either a class of systems can be implemented distributedly—and we aim at giving a structural characterisation of this class—or all systems can be implemented distributedly—and we aim to investigate the strongest behavioural equivalence that makes this possible.

Research Question and Tasks

The project will look at some particular formal mechanisms (e.g. process algebras, Petri nets, or Turing machines) and try to analyse the expressivity. The goal involves the development of systems that can be or that cannot be implemented (incl. formal proofs of this) in the mechanism under consideration.

General Information

NICTA (National ICT Australia) is Australia's Information and Communications Technology (ICT) Centre of Excellence. It is an independent company in the business of research, commercialisation and research training. With over 700 people, NICTA is the largest organisation in Australia dedicated to ICT research.

The internship is integrated in *Concurrency and Protocol Verification* (`http://ssrg.nicta.com.au/projects/concurrency/home.pml`), a highly motivated group with different backgrounds (e.g., formal methods and network engineers), working at different institutes (UNSW, NICTA, UQ, and Macquarie University). The successful applicant will work together with Prof. Rob van Glabbeek and Dr. Peter Höfner.

Sydney is the largest and most populous city in Australia. It is located on Australia's south-east coast of the Tasman Sea. With an approximate population of 4.5 million in the Sydney metropolitan area the city is the largest in Oceania. Sydney also ranks among the top 10 most liveable cities in the world according to Mercer Human Resource Consulting and The Economist.

Unfortunately, NICTA, as the host institute, cannot offer further financial scholarships.

Contact Information

If you have any questions concerning the internship, please do not hesitate to contact us:

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