

Special issue on “Combining Compositionality and Concurrency”: part 1

Rob J. van Glabbeek · Ursula Goltz ·
Ernst-Rüdiger Olderog

Published online: 30 December 2014
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In March 1988, we organised a workshop on “Combining Compositionality and Concurrency” in Königswinter near Bonn, Germany. We were motivated by the following dichotomy. On the one hand, a theory of concurrency was initiated by Carl Adam Petri, with notions like causality, conflict, and concurrency. On the other hand, a theory of communicating processes was developed by Robin Milner and Tony Hoare, where the emphasis was put on composing processes by algebraic operators like sequential, nondeterministic, and parallel composition.

For quite a some time little interaction took place between the followers of these two lines of research. Then it was more and more realized that a full understanding, analysis or construction of parallel processes is impossible without combining the best from concurrency and compositionality. The idea of the workshop was therefore to invite researchers active in the area of combining compositionality and concurrency.

In the meantime the relationships between these two directions have been carefully investigated. Today, the elements of the different semantic approaches are freely mixed. Also, the scope of systems that are modelled by concurrent or process algebraic means is much extended, for example, to mobile and probabilistic systems.

In 2013, we called for a workshop “25 Years of Combining Compositionality and Concurrency”. We received very enthusiastic responses, and the jubilee workshop took place in

R. J. van Glabbeek (✉)
NICTA and UNSW, Sydney, Australia
e-mail: rvg@cs.stanford.edu

U. Goltz (✉)
Institute for Programming and Reactive Systems, TU Braunschweig,
Braunschweig, Germany
e-mail: goltz@ips.cs.tu-by-de

E.-R. Olderog (✉)
Department for Computing, University of Oldenburg, Oldenburg, Germany
e-mail: olderog@informatik.uni-oldenburg.de

August 2013 at the very same venue in Königswinter as the first one.¹ This special issue results from a call for papers sent out right after the workshop. It comes in two parts: this first part comprises three papers.

The paper *Revisiting Causality, Coalgebraically* by Roberto Bruni, Ugo Montanari, and Matteo Sammartino recasts a causal semantics of concurrency originally defined by Darondeau and Degano in a coalgebraic setting. By exploiting the equivalence between coalgebras over a class of presheaves and history dependent automata, they derive a compact model.

The paper *Synthesis and Reengineering of Persistent Systems* by Eike Best and Raymond Devillers considers synthesis and reengineering problems in the framework of finite-state labelled transitions systems and place/transition Petri nets. They obtain exact conditions for a finite persistent transition system to be isomorphically implementable by a bounded Petri net exhibiting persistence in a structural way. Moreover, they derive an efficient algorithm to find such a net if it exists.

The paper *Revisiting Bisimilarity and its Modal Logic for Nondeterministic and Probabilistic Processes* by Marco Bernardo, Rocco De Nicola, and Michele Loretti investigates new notions of bi-similarity that correspond to extensions of the logic PML to probabilistic processes with internal nondeterminism; PML itself is a probabilistic version of Hennessy–Milner logic introduced by Larsen and Skou to characterise bisimilarity over probabilistic processes without internal nondeterminism.

¹ See <https://www.tu-braunschweig.de/ips/research/events/ws25ccc>.