

Fixed Points in Computer Science (FICS) 2013

Preface

This special issue of *Fundamenta Informaticae* contains revised and extended versions of contributions that were presented at the 6th edition of the workshop Fixed Points in Computer Science (FICS) 2013. The FICS 2013 workshop is was held on September 1st 2013 in Torino, as a satellite event of the EACSL Annual Conference on Computer Science Logic (CSL) 2013.

Fixed points play a fundamental role in several areas of computer science. They are used to justify (co)recursive definitions and associated reasoning techniques. The construction and properties of fixed points have been investigated in many different settings such as: design and implementation of programming languages, logics, verification, databases. The FICS workshop series aims to provide a forum for researchers of the computer science and logic communities who study or apply the theory of fixed points.

The special issue presents 7 papers.

The paper “Infinitary Axiomatization of the Equational Theory of Context-Free Languages” shows that the μ -continuity condition, along with the axioms of idempotent semi-rings, completely axiomatize the equational theory of the context-free languages.

The paper “Non-monotonic pre-fix points and Learning”, proves existence of pre-fix points of interactive realizers over arbitrary knowledge spaces, such pre-fix points represent a termination of a learning process with some state of knowledge which is complete and free from apparent contradictions.

The paper “Pebble games with algebraic rules”, defines a general framework for formulating two-player pebble games over finite structures. The framework covers not only games capturing finite-variable logics with and without counting but also those for the finite-variable fragment of matrix-rank logic. Moreover it includes a new type of games yielding a family of polynomial-time approximations of graph isomorphism.

The paper “Łukasiewicz μ -calculus” gives an effective procedure for calculating the output of Łukasiewicz μ -calculus terms on rational inputs. It is used to verify Łukasiewicz modal μ -calculus properties of finite rational probabilistic nondeterministic transition systems. It also provides an encoding of the logic PCTL in the Łukasiewicz modal μ -calculus.

The paper “CoCaml: Functional Programming with Regular Coinductive Types” extends functional programming with new primitives (namely, capsules and equation solvers) that allow to manip-

ulate regular coinductive types in a rich way. It gives several examples that cannot be directly written as pure functional programs, but can be elegantly expressed in CoCaml.

The paper “From Branching to Linear Time, Coalgebraically” builds on monads, relation lifting (a notion that is suitably generalised for the purpose) and multi-valued relations to provide a categorical and uniform analysis of state-based systems with linear-time behavior (although the approach is not by itself limited to linear time), represented as coalgebras.

The paper “Guard Your Daggers and Traces: Properties of Guarded (Co-)recursion” introduces the equational theory of fixed-point operators (and also trace operators) which are guarded by a modality (technically, a pointed endofunctor). Even though guards are often used to justify the existence of fixed-points, the approach of the paper also properly generalizes the iteration theories of Bloom and Ésik.

We dedicate this special issue to Zoltan Ésik who sadly passed away on the 25th of May 2016. His work on understanding laws governing fixed points had and will continue to have an important impact on theoretical computer science. Zoltan was the founder of the FICS workshop. Largely due to his constant efforts the workshop has gained its stable position among theoretical computer science events. Zoltan was for a long time Steering Committee chairman of FICS; he was very frequently involved in the work of the Program Committee, and in the edition of special issues. We will miss his vision, competence, and devotion to science.

We thank the authors for their contributions, and we are grateful to the reviewers for their valuable feedback.

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