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# PREFACE to COORDINATION and FORTE 2015 Special Issue

This special issue contains revised and extended versions of 7 papers, 3 of them presented at FORTE 2015, the 35th International Conference on Formal Techniques for Distributed Objects, Components and Systems, and 4 of them at COORDINATION 2015, the 17th International Conference on Coordination Models and Languages, held as part of DisCoTec 2015, the 10th International Federated Conference on Distributed Computing Techniques that took place in Grenoble, France, during June 2–5, 2015. The DisCoTec series is one of the major events sponsored by the International Federation for Information Processing (IFIP) WG 6.1.

The papers collected in this special issue were invited by the guest editors, taking into account the opinions of the Program Committee members and the expert reviewers expressed during the paper selection process of the two conferences. They underwent a new and thorough reviewing and revision process, in accordance with the usual high standards of LMCS. We are grateful to all authors for their contributions and to the reviewers of the conferences and of this special issue for their thorough and valuable work.

The paper "Privacy by typing in the $\pi$-calculus" by Dimitrios Kouzapas and Anna Philippou, addresses the important problem of formally checking whether a system design adheres to certain privacy policy. Based on ideas expounded by legal scholars, the paper identifies a privacy model and a formal framework to reason about privacy. The authors introduce a privacy calculus, variant of pi-calculus with groups extended with constructs for reasoning about private data, to define the semantics of systems to be analyzed. Privacy policies are described in a privacy policy language introduced in the paper that identifies the permissions different user groups may have for different pieces of private data. Finally, the paper introduces a type system to reason about privacy. The main theorem is a subject reduction and safety theorem that says that, if a system S described in the privacy calculus type checks and produces a permission interface that satisfies a policy P, then S complies with P. The paper has a couple of use cases to illustrate how the framework can used to reason about privacy.

The paper "Timed Session Types" by Massimo Bartoletti, Tiziana Cimoli, and Maurizio Murgia is concerned with the problem of designing and implementing distributed applications, where interaction is restricted to *compatible* participants. This restriction ensures that no undesirable deadlocks may be exhibited in the distributed application. One approach to tackle this problem is to use session types that identify the way in which a given component in a distributed system interacts with its environment. The standard approach to session types does not account for timing information on messages that are sent and received by participants. This paper addresses this crucial gap. In addition to introducing session types accounting for timing information, the paper also presents algorithms to tackle

All articles have already been published in the regular issues of Logical Methods in Computer Science.

crucial problems in this setting, namely, checking compliance and subtyping. Compliance is the problem where, given the session types of two components, the goal is to determine whether they communicate without deadlocking, while subtyping is the problem of determining whether a component can be substituted for another one in any distributed context. The novel algorithms for these problems presented exploit the close connection between the timed session types proposed in this paper and timed automata.

Event structures, introduced by Winskel in 1980, address the representation of relationships between individual events of a given set of events, usually capturing the notions of causality and conflict. Most frameworks consider static relationships between events. The paper "Dynamic Causality in Event Structures" by Youssef Arbach, David S. Karcher, Kirstin Peters and Uwe Nestmann proposes a notion of dynamic causality, where the causal relationship between events may depend on the occurrence of other events. The main advantage of such a notion of dynamic causality is the simplification of the representation of exception handling and other dependencies of the environment of the system.

The paper "Data optimizations for constraint automata", by Sung-Shik T.Q. Jongmans and Farhad Arbab, is studying constraint automata as a model for coordination. This work particularly focuses on optimization techniques such that the run-time code handles data constraints efficiently. Besides a theoretical expose of the approach, the paper documents an empirical study. Experiments with the compiler-generated code in isolation is shown to benefit from the proposed optimization techniques, yet more work is necessary to assess its benefits in a full program context.

Developing distributed software applications is hard enough as it is, but when runtime adaptations are required, a disciplined approach is needed to assure correct updates. The paper "Dynamic Choreographies: Theory and Implementation", by Mila Dalla Preda, Maurizio Gabbrielli, Saverio Giallorenzo, Ivan Lanese and Jacopo Mauro, is tackling this problem using a language called *Dynamic Interaction-Oriented Choreography* (AIOC) for specifying updateable components in the architecture. Applications generated from AIOC specifications have provable correctness properties, including being free from deadlock and race conditions. The approach is integrated into a IDE and runtime environment to support its practical usability.

The next paper is entitled "Asynchronous Distributed Execution of Fixpoint-Based Computational Fields", by Alberto Lluch Lafuente, Michele Loreti and Ugo Montanari. This paper follows a new trend in coordination models and languages that aims at capturing abstractions useful for large-scale deployed systems. It focuses on the paradigm of computational fields, used to model and design spatial computations involving devices spread in a physical environment. The paper proposes a technique rooted in mu-calculus to express computations over fields that are stabilizing, for they can be represented as recursive computations with a fixpoint. The approach is exemplified in a scenario of disaster recovery where rescuers wander the environment in search of nearest victims.

The paper "A Coordination Language for Databases", by Ximeng Li, Xi Wu, Alberto Lluch Lafuente, and Flemming Nielson, concerns a more traditional goal of coordination model and languages, that is, providing modeling techniques for distributed systems. In particular, the KLAIM process algebra is properly extended to model concepts of distributed databases. Remarkably, the type systems approach exploited in this paper can be used to

guarantee static correctness properties of processes accessing a distributed database, there including performing selection, update and aggregation of data.

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