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Transactions on Petri Nets and Other Models of Concurrency XI

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Preface by Editor-in-Chief

The 11th Issue of LNCS *Transactions on Petri Nets and Other Models of Concurrency* (ToPNoC) contains revised and extended versions of a selection of the best papers from the workshops held at the 36th International Conference on Application and Theory of Petri Nets and Concurrency (Petri Nets 2015, Brussels, Belgium, June 22–26, 2015) and the 15th International Conference on Application of Concurrency to System Design (ACSD 2015, Brussels, Belgium, June 22–26, 2015). It also contains one paper submitted directly to ToPNoC.

I would like to thank the two guest editors of this special issue: Jörg Desel and Jetty Kleijn. Moreover, I would like to thank all the authors, reviewers, and organizers of the Petri Nets 2015 and ACSD 2015 satellite workshops, without whom this issue of ToPNoC would not have been possible.

July 2016

Maciej Koutny

LNCS Transactions on Petri Nets and Other Models of Concurrency: Aims and Scope

ToPNoC aims to publish papers from all areas of Petri nets and other models of concurrency ranging from theoretical work to tool support and industrial applications. The foundations of Petri nets were laid by the pioneering work of Carl Adam Petri and his colleagues in the early 1960s. Since then, a huge volume of material has been developed and published in journals and books as well as presented at workshops and conferences.

The annual International Conference on Application and Theory of Petri Nets and Concurrency started in 1980. The International Petri Net Bibliography maintained by the Petri Net Newsletter contains over 10,000 entries, and the International Petri Net Mailing List has close to 2,000 subscribers. For more information on the International Petri Net community, see: <http://www.informatik.uni-hamburg.de/TGI/PetriNets/>

All issues of ToPNoC are LNCS volumes. Hence they appear in all main libraries and are also accessible on SpringerLink (electronically). It is possible to subscribe to ToPNoC without subscribing to the rest of the LNCS series.

ToPNoC contains:

- Revised versions of a selection of the best papers from workshops and tutorials concerned with Petri nets and concurrency
- Special issues related to particular subareas (similar to those published in the *Advances in Petri Nets* series)
- Other papers invited for publication in ToPNoC
- Papers submitted directly to ToPNoC by their authors

Like all other journals, ToPNoC has an Editorial Board, which is responsible for the quality of the journal. The members of the board assist in the reviewing of papers submitted or invited for publication in ToPNoC. Moreover, they may make recommendations concerning collections of papers for special issues. The Editorial Board consists of prominent researchers within the Petri net community and in related fields.

Topics

The topics covered include system design and verification using nets; analysis and synthesis, structure and behavior of nets; relationships between net theory and other approaches; causality/partial order theory of concurrency; net-based semantical, logical, and algebraic calculi; symbolic net representation (graphical or textual); computer tools for nets; experience with using nets, case studies; educational issues related to nets; higher-level net models; timed and stochastic nets; and standardization of nets.

Applications of nets to: biological systems; defence systems; e-commerce and trading; embedded systems; environmental systems; flexible manufacturing systems;

hardware structures; health and medical systems; office automation; operations research; performance evaluation; programming languages; protocols and networks; railway networks; real-time systems; supervisory control; telecommunications; cyber physical systems; and workflow.

For more information about ToPNoC see: <http://www.springer.com/lncs/topnoc>

Submission of Manuscripts

Manuscripts should follow LNCS formatting guidelines, and should be submitted as PDF or zipped PostScript files to ToPNoC@ncl.ac.uk. All queries should be addressed to the same e-mail address.

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Preface by Guest Editors

This volume of ToPNoC contains revised versions of a selection of the best workshop papers presented at the 36th International Conference on Application and Theory of Petri Nets and Other Models of Concurrency (Petri Nets 2015) and the 15th International Conference on Application of Concurrency to System Design (ACSD 2015), and papers describing winning contributions from the model checking contest.

We, Jörg Desel and Jetty Kleijn, are indebted to the Program Committees of the workshops and the model checking contest and in particular to their chairs. Without their enthusiastic work, this volume would not have been possible. Many members of the Program Committees participated in reviewing the new versions of the papers selected for this issue. We asked for the strongest contributions to the following satellite events:

- ATAED 2015: Workshop on Algorithms & Theories for the Analysis of Event Data (chairs: Wil van der Aalst, Robin Bergenthum, Josep Carmona)
- PNSE 2015: International Workshop on Petri Nets and Software Engineering (chairs: Daniel Moldt, Heiko Rölke, Harald Störrle)
- Model Checking Contest @ Petri Nets 2015 (chairs: Fabrice Kordon, Didier Buchs)

The best papers of the workshops were selected in close cooperation with their chairs. The authors were invited to improve and extend their results where possible, based on the comments received before and during the workshops. The resulting revised submissions were reviewed by two referees. We followed the principle of asking for fresh reviews of the revised papers, also from referees not involved initially in the reviewing of the original workshop contributions. All papers went through the standard two-stage journal reviewing process, and eventually nine were accepted after rigorous reviewing and revising. In addition to these first nine papers, two papers were submitted directly to the editor-in-chief of the ToPNoC series and handled by him as is usual for journal submissions. The papers describing the best tools of the model checking contest were evaluated and revised based on remarks and suggestions from several reviewers. They are summarized by the introductory contribution of Fabrice Kordon et al.

The paper “Pragmatics Annotated Coloured Petri Nets for Protocol Software Generation and Verification” by Kent Inge Fagerland Simonsen, Lars M. Kristensen, and Ekkart Kindler provides a formal definition of Pragmatics Annotated Coloured Petri Nets (PA-CPN), a class of Petri nets that can automatically be transformed into protocol software. The paper, moreover, demonstrates how to exploit the structure of PA-CPNs for verification.

The paper “A Petri Net-Based Approach to Model and Analyze the Management of Cloud Applications” by Antonio Brogi, Andrea Canciani, Jacopo Soldani, and PengWei Wang extends the TOSCA standard for specifying the topology and orchestration of cloud applications to behavioral aspects of management operations and their relations with states, requirements, and capabilities. This behavior is modelled by Open Petri Nets, thus supporting automated analysis of deployment plans.

The paper “Non-Interference Notions Based on Reveals and Excludes Relations for Petri Nets” by Luca Bernardinello, Gökem Kılınç, and Lucia Pomello introduces a

variety of non-interference notions for Petri nets that indicate that some internal behavior of a Petri net component cannot be inferred from its interface behavior. The notions are based on the previously known *reveals* relation (whenever a certain event occurs in a maximal occurrence net, the related one occurs, too) and a newly introduced, converse *excludes* relation.

The paper “Validating DCCP Simultaneous Feature Negotiation Procedure” by Somsak Vanit-Anunchai investigates the feature negotiation procedure of the Datagram Congestion Control Protocol in RFC 4340 using Coloured Petri Nets and state space analysis. The analysis result shows that the protocol can fail to an undesired state, which has the property that the feature values of both sides do not match and both sides are not aware of the mismatch. Simultaneous negotiation could be broken on even a simple lossless FIFO channel.

The paper “Integrating Petri Net Semantics in a Model-Driven Approach: The Renew Meta-Modeling and Transformation Framework” by David Mosteller, Lawrence Cabac, and Michael Haustermann deals with the development of modeling languages and automated generation of according tools for model-driven development on the basis of ontology-based meta-models. The approach is based on Petri nets; high-level Petri nets and low-level Petri nets in various forms can be used as target models. The RMT framework provides the generation of modeling tools and the transformation into executable and analyzable models, based on the respective Petri net semantics.

The paper “Mining Conditional Partial Order Graphs from Event Logs” by Andrey Mokhov, Josep Carmona, and Jonathan Beaumont uses Conditional Partial Order Graphs (CPOGs) for compact representation of families of partial orders for process mining. In particular, the representation problem of event logs with data is addressed. The paper provides algorithms for extracting both the control flow and the relevant data parameters from a given event log. Moreover, it shows how CPOGs can be used for efficient and effective visualization of the obtained results, which also can be used to reveal the hidden interplay between the control and data flows of a process.

The paper “Conditions for Petri Net Solvable Binary Words” by Kamila Barylska, Eike Best, Evgeny Erofeev, Łukasz Mikulski, and Marcin Piątkowski studies finite words with two letters that can be viewed as behavioral descriptions of place/transition Petri nets, which necessarily neither exhibit concurrency nor choices and possess only two transitions. Two conjectures providing different characterizations of this class of words are motivated and proposed. Several results are described, which amount to a partial proof of these conjectures.

The paper “Self-Tracking Reloaded: Applying Process Mining to Personalized Health Care from Labeled Sensor Data” by Timo Szttyler, Josep Carmona, Johanna Völker, and Heiner Stuckenschmidt provides ideas on how process-mining techniques can be used as a fine-grained evolution of traditional self-tracking, applied for personalized health care and based on daily live data recorded on smart devices. These ideas are applied to data of a set of people, yielding interesting conclusions and challenges.

The paper “A Method for Assessing Parameter Impact on Control-Flow Discovery Algorithms” by Joel Ribeiro and Josep Carmona tackles the problem of identifying parameters in control-flow discovery algorithms that are important for the applicability

of the algorithm to a given log, according to a given quality metric. The suggested solution is based on sensitivity analysis. The paper also presents a first, promising evaluation of this approach.

The paper “Negotiations and Petri Nets” by Jörg Desel and Javier Esparza was originally a contribution to the PNSE 2015 workshop and suggested for this issue by the workshop chairs. Since one of the authors, Jörg Desel, is involved as a guest editor of this issue, it was submitted directly to the editor-in-chief and handled by him independently. This paper studies the relation between negotiations, a previously introduced model of concurrency with multi-party negotiation atoms as primitive, and Petri nets. In particular, translations in either directions are considered as well as the resulting relative size of the respective models. The paper shows that sound and deterministic negotiations are closely related to live and safe free-choice Petri nets.

The paper “A Formal Framework for Diagnostic Analysis for Errors of Business Processes” by Suman Roy and A.S.M. Sajeew was submitted directly to ToPNoC through the regular submission track. This article develops a formal framework of diagnosing errors by locating their occurrence nodes in business process models at the level of sub-processes and swim-lanes. Graph-theoretic techniques and Petri net-based analyses are used to detect syntactic and control flow-related errors, respectively. The authors discover how error frequencies change with error depth, how they correlate with the size of the sub-processes and swim-lane interactions in the models, and how they can be predicted in terms of process metrics.

The book ends with contributions from the model checking contest, held at the 2015 Petri Net conference. In the article “MCC 2015 — The Fifth Model Checking Contest,” the authors introduce the event itself, but also the algorithms and tools that were successful at the contest. Therefore, this paper can be viewed as an introduction to the remaining four papers, in which the authors of successful tools describe their respective approaches and experiences.

As guest editors, we would like to thank all authors and referees who contributed to this issue. The quality of this volume is the result of the high scientific value of their work. Moreover, we would like to acknowledge the excellent cooperation throughout the whole process that has made our work a pleasant task. We are also grateful to the Springer/ToPNoC team for the final production of this issue.

June 2016

Jörg Desel
Jetty Kleijn

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