

**Irina Virbitskaite
Andrei Voronkov (Eds.)**

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Perspectives of Systems Informatics

**6th International Andrei Ershov Memorial Conference, PSI 2006
Novosibirsk, Russia, June 2006
Revised Papers**



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Irina Virbitskaite

A.P. Ershov Institute of Informatics Systems
Siberian Division of the Russian Academy of Sciences
6, Acad. Lavrentjev pr., 630090, Novosibirsk, Russia
E-mail: virb@iis.nsk.su

Andrei Voronkov

University of Manchester
Department of Computer Science
Oxford Road, Manchester, M13 9PL, UK
E-mail: voronkov@cs.man.ac.uk

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Preface

This volume contains the final proceedings of the Sixth International Andrei Ershov Memorial Conference on Perspectives of System Informatics (PSI 2006), held in Akademgorodok (Novosibirsk, Russia), June 27-30, 2006.

The conference was held to honour the 75th anniversary of a member of the Russian Academy of Sciences Andrei Ershov (1931–1988) and his outstanding contributions towards advancing informatics. The role of Andrei Ershov in the establishment and development of the theory of programming and systems programming in our country cannot be overestimated. Andrei was one of the founders of the Siberian Computer Science School. He guided and took active part in the development of the programming system ALPHA and the multi-language system BETA, and authored some of the most remarkable results in the theory of programming. Andrei is justly considered one of the founders of the theory of mixed computation. In 1974 he was nominated as Distinguished Fellow of the British Computer Society. In 1981 he received the Silver Core Award for services rendered to IFIP. Andrei Ershov's brilliant speeches were always in the focus of public attention. Especially notable were his lectures "Aesthetic and Human Factor in Programming" and "Programming—The Second Literacy." He was not only an extremely gifted scientist, teacher and fighter for his ideas, but also a bright and many-sided personality. He wrote poetry, translated the works of R. Kipling and other English poets, and enjoyed playing guitar and singing. Everyone who had the pleasure of knowing Andrei Ershov and working with him will always remember his great vision, eminent achievements and generous friendship.

Another aim of the conference was to provide a forum for the presentation and in-depth discussion of advanced research directions in computer science. For a developing science, it is important to work out consolidating ideas, concepts and models. Movement in this direction was a further goal of the conference.

The previous five PSI conferences were held in 1991, 1996, 1999, 2001, and 2003, and proved to be significant international events. The sixth conference followed the traditions of the previous ones and included many of their subjects, such as theoretical computer science, programming methodology, and new information technologies, which were among the most important contributions of system informatics. Similarly to the previous PSI conferences, the programme includes invited papers in addition to contributed regular and short papers.

This time 108 papers were submitted to the conference by researchers from 28 countries. Each paper was reviewed by three experts, at least two of them from the same or closely related discipline as the authors. The reviewers generally provided high-quality assessment of the papers and often gave extensive comments to the authors for the possible improvement of the presentation. As a result, the Program Committee selected 30 high-quality papers for regular presentations and 10 papers for short presentations. A broad range of hot

topics in system informatics was covered by five invited talks given by prominent computer scientists from different countries.

We are glad to express our gratitude to all the persons and organisations who contributed to the conference – to the authors of all the papers for their effort in producing the material included here, to the sponsors for their moral, financial and organizational support, to the members of the Steering Committee for the coordination of the conference, to the Programme Committee members and the reviewers who did their best to review and select the papers, and to the members of the Organizing Committee for their mutual contribution to the success of this event. Finally, we would like to mention the fruitful cooperation with Springer during the preparation of this volume.

November 2006

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We are grateful to the Russian Foundation for Basic Research, Microsoft Research, and Intel Corporation for the support of the conference.

We thank our Novosibirsk colleagues who contributed to PSI 2006.

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Table of Contents

Invited Papers

Separability in Conflict-Free Petri Nets	1
<i>Eike Best, Javier Esparza, Harro Wimmel, and Karsten Wolf</i>	
Grand Challenges of System Programming	19
<i>Victor Ivannikov</i>	
Specifying and Verifying Programs in Spec#	20
<i>K. Rustan and M. Leino</i>	
Basic Protocols: Specification Language for Distributed Systems	21
<i>Alexander Letichevsky</i>	
Why Automata Models Are Sexy for Testers?	26
<i>Alexandre Petrenko</i>	

Regular Papers

An Universal Resolving Algorithm for Inverse Computation of Lazy Languages	27
<i>Sergei Abramov, Robert Glück, and Yuri Klimov</i>	
Program Generation in the Equivalent Transformation Computation Model Using the Squeeze Method	41
<i>Kiyoshi Akama, Ekawit Nantajeewarawat, and Hidekatsu Koike</i>	
A Versioning and Evolution Framework for RDF Knowledge Bases	55
<i>Sören Auer and Heinrich Herre</i>	
A Graphical Approach to Prove the Semantic Preservation of UML/OCL Refactoring Rules	70
<i>Thomas Baar and Slaviša Marković</i>	
On the Usage of Concrete Syntax in Model Transformation Rules	84
<i>Thomas Baar and Jon Whittle</i>	
TTCN-3 for Distributed Testing Embedded Software	98
<i>Stefan Blom, Thomas Deiß, Natalia Ioustinova, Ari Kontio, Jaco van de Pol, Axel Rennoch, and Natalia Sidorova</i>	
Chase of Recursive Queries	112
<i>Nieves R. Brisaboa, Antonio Fariña, Miguel R. Luaces, and José R. Paramá</i>	

Improving Semistatic Compression Via Pair-Based Coding	124
<i>Nieves R. Brisaboa, Antonio Fariña, Gonzalo Navarro, and José R. Paramá</i>	
An Agent-Based Architecture for Dialogue Systems	135
<i>Mark Buckley and Christoph Benzmüller</i>	
Encoding Mobile Ambients into the π -Calculus	148
<i>Gabriel Ciobanu and Vladimir A. Zakharov</i>	
Characterizations of CD Grammar Systems Working in Competence Mode by Multicounter Machine Resources.....	166
<i>Liliana Cojocaru</i>	
Deriving State-Based Implementations of Interactive Components with History Abstractions	180
<i>Walter Dosch and Annette Stümpel</i>	
Introducing Debugging Capabilities to Natural Semantics	195
<i>Alberto de la Encina, Luis Llana, and Fernando Rubio</i>	
Solution Strategies for Multi-domain Constraint Logic Programs	209
<i>Stephan Frank, Petra Hofstedt, Peter Pepper, and Dirk Reckmann</i>	
Information-Flow Attacks Based on Limited Observations	223
<i>Damas P. Gruska</i>	
Verifying Generalized Soundness of Workflow Nets	235
<i>Kees van Hee, Olivia Oanea, Natalia Sidorova, and Marc Voorhoeve</i>	
Specifying Monogenetic Specializers by Means of a Relation Between Source and Residual Programs.....	248
<i>Andrei Klimov</i>	
Satisfiability of Viability Constraints for Pfaffian Dynamics.....	260
<i>Margarita Korovina and Nicolai Vorobjov</i>	
On the Importance of Parameter Tuning in Text Categorization	270
<i>Cornelis H.A. Koster and Jean G. Beney</i>	
Preconditions for Structural Synthesis of Programs	284
<i>Vahur Kotkas</i>	
How to Verify and Exploit a Refinement of Component-Based Systems	297
<i>Olga Kouchnarenko and Arnaud Lanoix</i>	
Refinements in Typed Abstract State Machines	310
<i>Sebastian Link, Klaus-Dieter Schewe, and Jane Zhao</i>	

Report on an Implementation of a Semi-inverter	322
<i>Torben Ægidius Mogensen</i>	
Loop Parallelization in Multi-dimensional Cartesian Space	335
<i>Saeed Parsa and Shahriar Lotfi</i>	
An ASM Semantics of Token Flow in UML 2 Activity Diagrams	349
<i>Stefan Sarstedt and Walter Guttman</i>	
Well-Structured Model Checking of Multiagent Systems	363
<i>N.V. Shilov and N.O. Garanina</i>	
Development of a Robust Data Mining Method Using CBFS and RSM	377
<i>Sangmun Shin, Yi Guo, Yongsun Choi, Myeonggil Choi, and Charles Kim</i>	
Pushout: A Mathematical Model of Architectural Merger	389
<i>Andrew Solomon</i>	
A Formal Model of Data Privacy	400
<i>Phiniki Stouppa and Thomas Studer</i>	
Linear Complementarity and P-Matrices for Stochastic Games	409
<i>Ola Svensson and Sergei Vorobyov</i>	

Short Papers

RapidOWL — An Agile Knowledge Engineering Methodology	424
<i>Sören Auer and Heinrich Herre</i>	
BURS-Based Instruction Set Selection	431
<i>Dmitri Boulytchev</i>	
Improved Resolution-Based Method for Satisfiability Checking Formulas of the Language L	438
<i>Anatoly Chebotarev and Sergey Krivoi</i>	
Real-Time Stable Event Structures and Marked Scott Domains: An Adjunction	443
<i>R.S. Dubtsov</i>	
Streaming Networks for Coordinating Data-Parallel Programs	451
<i>Clemens Grelck, Sven-Bodo Scholz, and Alex Shafarenko</i>	
Formal Methods in Industrial Software Standards Enforcement	456
<i>Alexey Grinevich, Alexey Khoroshilov, Victor Kuliainin, Denis Markovtsev, Alexander Petrenko, and Vladimir Rubanov</i>	

Visual Rules Modeling 467
 Sergey Lukichev and Gerd Wagner

Security for Multithreaded Programs Under Cooperative Scheduling 474
 Alejandro Russo and Andrei Sabelfeld

A Fully Dynamic Algorithm for Recognizing and Representing Chordal
Graphs 481
 Tursunbay kzyy Yrysgul

A Knowledge Portal for Cultural Information Resources: Towards
an Architecture 487
 *Yury Zagorulko, Jawed Siddiqi, Babak Akhgar, and
 Olesya Borovikova*

Author Index 495

Separability in Conflict-Free Petri Nets

Eike Best¹, Javier Esparza², Harro Winkel¹, and Karsten Wolf³

¹ Parallel Systems, Department of Computing Science
Carl von Ossietzky Universität Oldenburg, D-26111 Oldenburg, Germany
{eike.best,harro.winkel}@informatik.uni-oldenburg.de

² Abteilung Sichere und Zuverlässige Softwaresysteme
Institut für Formale Methoden der Informatik, D-70569 Universität Stuttgart
esparza@informatik.uni-stuttgart.de

³ Institut für Informatik, D-18051 Universität Rostock
karsten.wolf@uni-rostock.de

Abstract. We study whether transition sequences that transform markings with multiples of a number k on each place can be separated into k sequences, each transforming one k -th of the original marking. We prove that such a separation is possible for marked graph Petri nets, and present an inseparable sequence for a free-choice net.

1 Introduction

In concurrent systems verification, it is desirable to keep the portion of the state space that needs to be explored in order to check some property as small as possible. For example, if a system can be viewed as the composition of k independent but similar systems, it may be sufficient to check only one of them, instead of the whole set.

We are interested in Petri nets with k -markings, where by definition, a k -marking is a marking with a multiple of k tokens on each place (k being some positive natural number). We study under which conditions a Petri net with an initial k -marking M_0 can be separated, that is, viewed as k independent systems, each with initial marking $(1/k) \cdot M_0$. In such cases, some verification problems (for example, the reachability of a k -marking) can be solved in a system with greatly reduced state space.

The concept of separability has first been introduced and motivated in the context of workflow nets [6]. In that paper, a class of acyclic marked graphs [1,4] was proved to enjoy the separability property. In the present paper, we extend this result to all marked graphs. We also show by means of a counterexample that the separability property is not generally valid for free-choice nets [2].

The paper is organised as follows: Section 2 contains basic definitions and introduces the notion of separability formally. Section 3 contains the proof of the main result. In Section 4, we explore generalisations and limitations of this result. Section 5 contains concluding remarks.