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Transactions on Computational Science II

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LNCS Transactions on Computational Science

Computational science, an emerging and increasingly vital field, is now widely recognized as an integral part of scientific and technical investigations, affecting researchers and practitioners in areas ranging from aerospace and automotive research to biochemistry, electronics, geosciences, mathematics, and physics. Computer systems research and the exploitation of applied research naturally complement each other. The increased complexity of many challenges in computational science demands the use of supercomputing, parallel processing, sophisticated algorithms, and advanced system software and architecture. It is therefore invaluable to have input by systems research experts in applied computational science research.

Transactions on Computational Science focuses on original high-quality research in the realm of computational science in parallel and distributed environments, also encompassing the underlying theoretical foundations and the applications of large-scale computation. The journal offers practitioners and researchers the possibility to share computational techniques and solutions in this area, to identify new issues, and to shape future directions for research, and it enables industrial users to apply leading-edge, large-scale, high-performance computational methods.

In addition to addressing various research and application issues, the journal aims to present material that is validated – crucial to the application and advancement of the research conducted in academic and industrial settings. In this spirit, the journal focuses on publications that present results and computational techniques that are verifiable.

Scope

The scope of the journal includes, but is not limited to, the following computational methods and applications:

- Aeronautics and Aerospace
- Astrophysics
- Bioinformatics
- Climate and Weather Modeling
- Communication and Data Networks
- Compilers and Operating Systems
- Computer Graphics
- Computational Biology
- Computational Chemistry
- Computational Finance and Econometrics
- Computational Fluid Dynamics
- Computational Geometry

- Computational Number Theory
- Computational Physics
- Data Storage and Information Retrieval
- Data Mining and Data Warehousing
- Grid Computing
- Hardware/Software Co-design
- High-Energy Physics
- High-Performance Computing
- Numerical and Scientific Computing
- Parallel and Distributed Computing
- Reconfigurable Hardware
- Scientific Visualization
- Supercomputing
- System-on-Chip Design and Engineering

Preface

The denotational and expressive needs in cognitive informatics, computational intelligence, software engineering, and knowledge engineering have led to the development of new forms of mathematics collectively known as denotational mathematics. *Denotational mathematics* is a category of mathematical structures that formalize rigorous expressions and long-chain inferences of system compositions and behaviors with abstract concepts, complex relations, and dynamic processes. Typical paradigms of denotational mathematics are concept algebra, system algebra, Real-Time Process Algebra (RTPA), Visual Semantic Algebra (VSA), fuzzy logic, and rough sets. A wide range of applications of denotational mathematics have been identified in many modern science and engineering disciplines that deal with complex and intricate mathematical entities and structures beyond numbers, Boolean variables, and traditional sets.

This issue of Springer's Transactions on Computational Science on *Denotational Mathematics for Computational Intelligence* presents a snapshot of current research on denotational mathematics and its engineering applications. The volume includes selected and extended papers from two international conferences, namely IEEE ICCI 2006 (on *Cognitive Informatics*) and RSKT 2006 (on *Rough Sets and Knowledge Technology*), as well as new contributions. The following four important areas in denotational mathematics and its applications are covered:

- *Foundations and applications of denotational mathematics,* focusing on: a) contemporary denotational mathematics for computational intelligence; b) denotational mathematical laws of software; c) a comparative study of STOPA and RTPA; and d) a denotational mathematical model of abstract games.
- *Rough and fuzzy set theories,* focusing on: a) transformation of vague sets to fuzzy sets; b) reduct construction algorithms; and c) attribute set dependence in reduct computation.
- *Granular computing,* focusing on: a) mereological theories of concepts; and b) rough logic and reasoning.
- *Knowledge and information modeling,* focusing on: a) semantic consistency of knowledge bases; b) contingency matrix theory; and c) analysis of information tables containing stochastic values.

The editors believe that the readers of the *Transactions on Computational Science* (TCS) series will benefit from the papers presented in this special issue on the latest advances in denotational mathematics and applications in cognitive informatics, natural intelligence, computational intelligence, and AI.

Acknowledgments

The guest editors of this *Special Issue on Denotational Mathematics for Computational Intelligence* in Springer's *Transactions on Computational Science* series, would

like to thank all authors for submitting their latest interesting work. We are grateful to the program committee members of the IEEE ICCI 2006 and RSKT 2006 conferences, as well as the reviewers, for their great contributions to this special issue. We would like to thank the Editors-in-Chief of TCS, Dr. Marina L. Gavrilova and Dr. Chih Jeng Kenneth Tan, for their advice, vision, and support. We also thank the editorial staff at Springer for their professional help during the publication of this special issue.

June 2008   Yingxu Wang
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Table of Contents

Regular Papers