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# Cellular Automata

10th International Conference on Cellular Automata  
for Research and Industry, ACRI 2012  
Santorini Island, Greece, September 24-27, 2012  
Proceedings



Springer

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# Preface

This volume collects the papers selected for presentation at the 10th International Conference on Cellular Automata for Research and Industry (ACRI 2012), held on Santorini Island (Greece), September 24–27, 2012. ACRI 2012 was organized by the Democritus University of Thrace as a forum for the presentation and discussion of specialized results as well as general contributions to the growth of the cellular automata approach and its application. Cellular automata represent a very powerful approach to the study of spatio-temporal systems where complex phenomena are built up out of many simple local interactions. The ACRI conference series was first organized in Italy, namely ACRI 1994 in Rende, ACRI 1996 in Milan, and ACRI 1998 in Trieste, and followed by ACRI 2000 in Karlsruhe (Germany), ACRI 2002 in Geneva (Switzerland), ACRI 2004 in Amsterdam (The Netherlands), ACRI 2006 in Perpignan (France), ACRI 2008 in Yokohama (Japan), and ACRI 2010 in Ascoli Piceno (Italy).

ACRI conferences have been offering since 1994 a biennial scientific meeting to both scientists and innovation managers in academia and industry to express and discuss their viewpoints on current and future trends, challenges, and state-of-the-art solutions to various problems in the fields of arts, biology, chemistry, communication, cultural heritage, ecology, economy, geology, engineering, medicine, physics, sociology, traffic control, etc. The ACRI conferences have been traditionally focused on challenging problems and new research, not only on theoretical but also on applicational aspects of cellular automata, including cellular automata tools and computational sciences. The conference series is also concerned with applications and solutions of problems from the fields of physics, engineering, environment science, social science, and life sciences. Its primary goal is to discuss problems from a variety of scientific fields, to identify new issues, and to enlarge the research fields of cellular automata. Since its inception, the ACRI conference has attracted an ever-growing community and has raised knowledge and interest in the study of cellular automata for both new entrants into the field as well as researchers already working on particular aspects of cellular automata.

In order to give a perspective in which both theoretical and applicational aspects of cellular automata contribute to the growth of the area, this book mirrors the structure of the conference, grouping the 88 papers into two main parts. The first part collects papers presented as part of the main conference and organized according to six main topics: (1) theoretical results on cellular automata, (2) cellular automata dynamics, control and synchronization, (3) cellular automata and networks, (4) modeling and simulation with cellular automata, (5) cellular automata-based hardware and architectures, and (6) codes, pseudorandom number generators and cryptography with cellular automata. The second part of the volume is dedicated to contributions presented during the ACRI 2012

workshops on theoretical advances, specifically Asynchronous Cellular Automata (2<sup>nd</sup> workshop, chairs: Alberto Dennunzio, Enrico Formenti, and Nazim Fatès), and challenging application contexts for cellular automata: Crowds and Cellular Automata (4<sup>th</sup> workshop, chairs: Sara Manzoni, Ioakeim Georgoudas, and Georgios Sirakoulis), Traffic and Cellular Automata (2<sup>nd</sup> workshop, chairs: Katsuhiro Nishinari and Andreas Schadschneider), and the satellite workshop on Cellular Automata of Cancer Growth and Invasion (chairs: Michael Meyer-Hermann, Andreas Deutsch, and Haralampos Hatzikirou).

Many people contributed to the success of ACRI 2012 and to the creation of this volume, from the initial idea to its implementation. Our first acknowledgement goes to all the scientists that submitted their works, and to all Program Committee members and reviewers for their precious collaboration. A special thanks for their hospitality to the Municipality of Santorini, Petros Nomikos Conference Center, and for its generous contribution to the realization of this volume to the Research Committee of the Democritus University of Thrace. A special acknowledgement also to all the people involved in the organization of ACRI 2012 (in particular, alphabetically ordered, to: Prodromos Chatziagorakis, Savvas Chatzichristofis, Konstantinos Ioannidis, Michail-Antisthenis Tsompanas, Ioannis Vourkas, and especially to Christos Mavrakakis as well to Giuseppe Vizzari) whose work was really fundamental for the actual success of the event.

Finally, we would like to thank the Department of Electrical and Computer Engineering of Democritus University of Thrace as well as the Complex Systems and Artificial Intelligence (CSAI) research center of the University of Milano-Bicocca, and all those institutes and organizations that financially supported the congress.

September 2012

Georgios Ch. Sirakoulis  
Stefania Bandini

# Organization

ACRI 2012 was organized by the Laboratory of Electronics of the Department of Electrical and Computer Engineering of the Democritus University of Thrace.

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