

Preface

This volume contains a collection of original papers covering a variety of theoretical results and applications of cellular automata, that were selected for presentation at the 12th International Conference on Cellular Automata for Research and Industry - ACRI 2016, held in Fez, Morocco, September 5–8, 2016. The conference was organized by the University of Perpignan, IMAGES_Espace-Dev, the UMR 228 IRD UM UG UR “Espace pour le Développement”, and the AGH University of Science and Technology of Kraków, Poland, in association with the International Systems Theory Network located in Morocco and represented by the University Moulay Ismail of Méknès. Its primary goal was to bring together researchers from a large variety of scientific fields in order to enforce international collaborations on cellular automata research as well as spread knowledge between experts in several scientific areas: pure and applied mathematics, computer science, physics, biology, and mathematical systems theory.

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. They are discrete, abstract computational systems that have proved useful both as general models of complexity and as simplified representations of non-linear dynamics in a wide range of scientific areas. In the last few decades, cellular automata have generated a great deal of interest both in academia and industry as they are attracting an increasing community of researchers working in different fields and dealing with theoretical aspects as well as practical applications.

The ACRI conference series was first organized in Italy, namely, ACRI 1994 in Rende, ACRI 1996 in Milan, 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), ACRI 2010 in Ascoli Piceno (Italy), ACRI 2012 on Santorini Island (Greece), and ACRI 2016 in Kraków (Poland).

From the start, ACRI conferences have constituted interesting biennial scientific meetings for researchers and innovation managers in academia and industry. They are dedicated to the expression and discussion of viewpoints on current and future trends, challenges, and state-of-the-art solutions to various problems in the fields of physics, biology, chemistry, communication, theoretical computer science, ecology, economy, geology, engineering, medicine, sociology, traffic control, etc.

This 12th ACRI conference aimed at widening the classical topics to include other areas related to or extending cellular automata. This offered a larger community the opportunity to discuss their work in various related fields such as: complex networks, lattice gas and lattice Boltzmann models, bio-inspired computing, agent-based models, etc.

This volume contains invited contributions and accepted papers from the main track and from the three organized workshops. We would like first to take this opportunity to express our sincere thanks to the invited speakers who kindly accepted our invitation to

give plenary lectures at ACRI 2016: Anna Lawniczak from Ghelph University, Canada; Bastien Chopard from the University of Geneva, Switzerland; Bernard De Baets from Ghent University, Belgium; and Laurent Lefèvre from INP Grenoble, ESISAR, France. We regret that Raul Rechtman, from the National Autonomous University of Mexico, had to cancel his talk.

The submission and refereeing process was supported by the EasyChair conference management system. Each submission was reviewed by at least three referees and finally 45 articles were selected for oral presentation at the conference, from a total of 60 submissions. We express our gratitude to the Program Committee members for their excellent work in making this selection. We also thank the additional external reviewers for their careful evaluation. All these efforts were the basis for the success of ACRI 2016.

The whole book is divided into two parts. The first part deals with theoretical and computational aspects and the second one with applications derived from physical, biological, environmental, and other systems. Each part is partitioned into sections containing a number of papers arranged in alphabetical order. The first part is organized according to three topics: (1) Cellular Automata Theory and Implementation (2) Cellular Automata Dynamics and Synchronization (3) Asynchronous Cellular Automata and Asynchronous Discrete Models - ACA. The second part of the volume contains three topics: (4) Modelling and Simulation with Cellular Automata (5) Crowds, Traffic, and Cellular Automata – CT&CA (6) Agent-Based Simulation and Cellular Automata – ABS&CA.

The contributions from topics (3), (5), and (6) were selected within the organized workshops ACA, CT&CA, and ABS&CA respectively. On this occasion, we would like to express our sincere thanks to the workshop chairs for their very good and valuable work, specifically Stefania Bandini, Andreas Schadschneider, and Katsuhiro Nishinari for the workshop on Traffic, Crowds, and CA; Alberto Dennunzio, Nazim Fates, and Enrico Formenti for the workshop on Asynchronous Cellular Automata and Asynchronous Discrete Models; and Andreas Pyka, Giuseppe Vizzari, and Jarosław Wąs for the workshop on Agent-Based Simulation and CA.

It should be stressed that the realization of this conference would have been impossible without the help and continuous encouragement of a number of people, especially the members of Steering Committee who strongly supported the organization of ACRI 2016 in Fez, Morocco.

Many people contributed to the success of ACRI 2016 and to the accomplishment of this volume. Our first acknowledgement is to all the scientists that submitted their work, and to all Program Committee members and reviewers for their precious collaboration.

In particular, we would like to express our gratitude to the International Organizing Committee for their excellent work, as well as to the Local Organizing Committee from Morocco for their help with local logistics. A special mention goes to Franco Bagnoli, Abdelhaq El Jai, and Yves Maurissen for their strong involvement during the organization of this conference.

Finally, the organization of ACRI 2016 was made possible thanks to the financial support of the international Systems Theory Network, the Academy of Science and Technology in Morocco, the laboratory “ESPACE pour le Développement”, UMR 228 IRD UM UG UR, the Institute of Research and Development-IRD, specifically the “Département Dynamiques Internes et de Surface des Continents” - DISCO, the University Moulay Ismaïl and the Science Faculty of Méknès, and other institutions and local authorities.

July 2016

Samira El Yacoubi
Jarosław Wąs
Stefania Bandini

Cellular Automata

12th International Conference on Cellular Automata for

Research and Industry, ACRI 2016, Fez, Morocco,

September 5-8, 2016. Proceedings

El Yacoubi, S.; Wąs, J.; Bandini, S. (Eds.)

2016, XXIII, 468 p. 208 illus., Softcover

ISBN: 978-3-319-44364-5