



Preface

Alberto Dennunzio¹ · Enrico Formenti²

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The “Fourth International Workshop on Asynchronous Cellular Automata” (ACA 2016) was held in Fez, Morocco, in the period September 5th–8th, 2016 as a satellite event of the 12th International Conference on Cellular Automata for Research and Industry (ACRI 2016).

The ACA workshop series is devoted to the study of the role of asynchrony in the dynamics of cellular automata (CA) and related models. Cellular Automata are a well-established formal tool for modelling complex systems encountered in many different scientific disciplines, with an ever increasing involvement in industrial applications. Synchrony is one of the main features of classical CA evolutions. Indeed, in the most common CA framework, all cells are updated simultaneously at each discrete time step. Recent trends consider the modelling of asynchronous systems based on local interactions.

The aim of this workshop is to bring together researchers dealing with the theme of the asynchrony within CA and other discrete models, e.g., discrete multi-agents systems and boolean networks, in order to foster their interaction and to provide a forum for presenting new ideas and work in progress.

Typical, but not exclusive, topics of the workshop include: various aspects of asynchronous cellular automata (dynamics, computational complexity issues, emergent properties); models of parallelism and distributed systems; models of real phenomena from biology, chemistry, physics, engineering and other fields; applications of asynchronous automata (genetic regulation networks, network coding, load balancing, etc).

After an additional peer review process, three papers from the ACA workshop were selected and included in this special issue. They are now presented in an extended and improved form with respect to the already refereed workshop versions that were included in the proceedings of the ACRI 2016 conference.

The paper by Ebrahim Patel studies the effect of asynchrony in classical additive cellular automata. It focusses on the impact of the size of the alphabet on the dynamical behavior under the maxmin- ω updating scheme.

The paper by Luca Mariot, Luca Manzoni and Alberto Dennunzio is pursuing the study of asynchrony immunity in CA. It establishes some properties of asynchronous immune CA and use them to generate an exhaustive list of such CA, which might be useful also in practical applications.

The paper by Eric Goles et al. studies a variant of Boolean automata networks in which asynchrony is introduced through the notion of delay. In particular, for arbitrary networks composed of two vertices, the authors characterize the delay phase space, i.e., the delay values such that networks admits limit cycles or fixed points.

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Enrico Formenti
Alberto Dennunzio

✉ Enrico Formenti
enrico.formenti@univ-cotedazur.fr
Alberto Dennunzio
dennunzio@disco.unimib.it

¹ Dipartimento di Informatica, Sistemistica e Comunicazione,
Università degli Studi di Milano-Bicocca, Viale Sarca
336/14, 20126 Milan, Italy

² Université Côte D’Azur (UCA), CNRS, I3S, Nice, France