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EDITORIAL

Preface

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Reaction systems is a model of computation inspired by the functioning of the living cell. The basic mechanism in reaction systems consists of the interactions between biochemical reactions in the cell. These interactions are driven by the two mechanisms describing reactions: facilitation and inhibition. The product of some reactions may constitute the reactants of some other reactions, thus facilitating them, and it may include inhibitors of some other reactions, thus inhibiting them. The interactions with the environment are also explicitly included in reaction systems. From these interactions, a set of dynamic processes arises, leading to a rich computational framework where cause–effect relationships are at the forefront of the computation.

Since their introduction about 10 years ago, reaction systems matured into a fruitful and dynamically evolving research area, which attracted a noticeable group of researchers. The original motivation was to understand interactions of biochemical reactions in the living cell and since then, reaction systems have developed as an innovative approach to formal modelling of biological systems. They have also become a popular novel model of interactive computation.

This special issue is based on the workshop and school on reaction systems that took place in Toruń, Poland, in June 2019 and on the one that was planned to take place in Turku, Finland, in June 2020, but had to be cancelled because of the COVID-19 pandemic. The first workshop took place in Milano, Italy, June 2018. This workshop series is driven by the growing interest in reaction systems research. Its goal is to provide a forum for exchanging research ideas and for initiating new or strengthening existing collaborations.

This special issue consists of six articles. All of them went through an independent peer-review process following the standard review process of the journal. They offer a broad snapshot of the current research landscape in reaction systems. We discuss each of them briefly below.

The paper by Luca Manzoni, Antonio E. Porreca and Grzegorz Rozenberg is titled "Facilitation in Reaction Systems". The authors focus on the facilitation aspect of reaction systems, described through positive dependency graphs. They demonstrate how properties of the dependency graphs influence the behavioural properties of reaction systems.

The paper by Wen Chean Teh and Adrian Atanasiu is titled "Simulation of Reaction Systems by the Strictly Minimal Ones". In this paper the new canonical class of reaction systems, called strictly minimal reaction systems is proposed. Authors revisited and strengthened some results on the simulation by reaction systems.

The paper by Bogdan Aman and Gabriel Ciobanu is titled "Mutual Exclusion and Reversibility in Reaction Systems". The authors define restricted reaction systems which are working with mutually exclusive rules. They also analyse the notion of reversibility in the context of reaction systems.

The paper by Attila Bagossy and György Vaszil is titled "Simulating Reversible Computation with Reaction Systems". This is another paper where the notion of reversibility in the framework of reaction systems is studied. Authors define reversible reaction systems and construct for them simulator that can traverse the reversible states back and forth.

The paper by Daniela Genova, Hendrik Jan Hoogeboom and Zornitza Prodanoff is titled "Extracting Reaction Systems from Function Behavior". In this paper, authors optimise the size of reaction system identified with Boolean function, Boolean formula or logic circuit. The resulting systems are functionally equivalent with the processed ones.

The paper by Roberto Barbuti, Roberta Gori, Paolo Milazzo and Lucia Nasti is titled "A survey of gene regulatory networks modelling methods: from ODEs, to Boolean

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and bioinspired models". Authors provide an overview on computational approaches to Gene Regulatory Networks. They present both quantitative and qualitative approaches, reaction systems being an example of the former ones.

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