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Bio-Inspired Computing: Theories and Applications (BIC-TA 2017)

Preface

This Fundamenta Informaticae special issue on "Bio-Inspired Computing: Theories and Applications" collects a selection of ten revised and extended papers presented at the 12th edition of the International Conference on Bio-Inspired Computing: Theories and Applications (BIC-TA 2017).

BIC-TA is a series of conferences that aims to bring together researchers working in the main areas of natural computing inspired from biology, for presenting their recent results, exchanging ideas, and cooperating in a friendly framework. Since 2006, the conference was held in Wuhan (2006), Zhengzhou (2007), Adelaide (2008), Beijing (2009), Liverpool and Changsha (2010), Penang (2011), Gwalior (2012), Huangshan (2013), Wuhan (2014), Hefei (2015), and Xi'an (2016). Following the success of the previous editions, BIC-TA 2017 was held on December 1-3, 2017, in Harbin, China.

BIC-TA 2017 attracted a wide spectrum of interesting research papers on various aspects of bio-inspired computing with a diverse range of theories and applications, where 13 papers were selected for the special issue. The authors were asked to significantly revise and improve their original conference contributions. Finally, 10 papers were accepted after the standard peer-review procedure, which cover the topics of DNA computing, membrane computing, evolutionary computation, and others.

In the paper "Handling non-determinism in spiking neural P systems: algorithms and simulations", the authors proposed an algorithm for simulating non-deterministic spiking neural P systems and demonstrated the effectiveness of this algorithm in terms of time and space on GPUs for simulating non-uniform and uniform solutions to the Subset Sum problem.

In the paper "Adaptive differential evolution with elite opposition-based learning and its application to training artificial neural networks", a new variant of differential evolution algorithm was proposed. The optimization performance of the proposed algorithm was verified with a comparison of five state-of-the-art differential evolution algorithms.

In the paper "The Hamiltonian cycle and travelling salesman problems in cP systems", the authors continued the research on P systems with complex objects (cP systems) for solving the Hamiltonian cycle and travelling salesman problems. An efficient P system algorithm based on cP systems was proposed for solving these problems.

In the paper "Design and analysis of complement circuit by using DNA strand displacement reaction", a four-bit complement logic circuit based on DNA strand displacement was designed and simulated. The simulation results show that the designed circuit is reliable, which also indicated that the DNA strand displacement has bright future in the construction of large-scale logic circuits.

In the paper "DNA ion detector and logic circulation amplification model based on mercury and silver ions", the authors constructed two bidirectional mercury and silver ion detectors, both of which can be used to detect mercury and silver ions at the same time. In addition, they built a cascading "AND" logic gate. The feasibility of these models by PAGE and fluorescence alteration was proved.

In the paper "The computational power of cell-like P systems with symport/antiport rules and promoters", the computational power of cell-like P systems with symport/antiport rules and promoters was investigated. The universality of such P systems working in the maximally parallel mode was obtained when having an arbitrary large number of membranes and promoters and using only symport rules of length 1 or antiport rules of length 2.

In the paper "A circuit simplification mechanism based on DNA combinatorial strands displacement", the AND gate, OR gate, and XOR gate were constructed by the combinatorial strand displacement mechanism. On this basis, the half-adder and encoder circuit were constructed. Furthermore, the kinetics process of strand displacement was simulated and analyzed by means of a chemical reaction network.

In the paper "A novel chaotic system and its modified compound synchronization", the authors proposed a new chaotic system, and discussed its dynamical behaviors with the change of the parameters in detail. Furthermore, they investigated a novel kind of modified compound synchronization.

In the paper "Logic operation model of the complementer based on two-domain DNA strand displacement", a four bit binary number complementer based on two-domain DNA strand displacement was proposed, which can implement the function of converting binary code into complement code. The feasibility of the complementer was verified based on Visual DSD software. This work made a useful exploration for further expanding the application of molecular logic circuits.

In the paper "The design of RNA biosensor based on nano-gold and magnetic nano-particle", a design strategy for RNA biosensor based on nano-gold and magnetic nano-particle was proposed. This RNA biosensor can provide an alternative method to monitor the environment of drinking water with potential applications in various monitoring fields.

We would like to thank all of the authors, as well as the anonymous reviewers of the papers for their hard work towards the publication of the special issue. We gratefully appreciate the Editor-in-Chief Prof. Damian Niwinski. This issue would not have been realized without his guidance and patience.

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