

BIOINSPIRED OPTIMIZATION METHODS AND THEIR APPLICATIONS

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Preface

Competing among themselves and adapting to the environment, members of biological populations accumulate experience and improve their performance. Their genetic material is recombined and propagated from generation to generation according to the laws of genetics. Relying on elementary activities of individuals, societies of insects and bird flocks exhibit complex emergent behavior. These and many other fascinating natural phenomena have been a rich source of inspiration in computer algorithms design for decades. As a result, the family of bioinspired algorithms has become quite large and includes evolutionary algorithms, ant colony optimization, particle swarm optimization, and artificial immune systems, to name just a few. They were designed to overcome the drawbacks of traditional algorithms in demanding application scenarios where little, if any, information is available to assist problem solving. Optimization is an area where these techniques are studied and exercised with particular practical success.

This volume contains recent theoretical and practical contributions to the field of bioinspired optimization presented at the Fourth International Conference on Bioinspired Optimization Methods and their Applications (BIOMA 2010), held at the Jožef Stefan Institute, Ljubljana, Slovenia, on 20 and 21 May 2010.

Encouraged by the success of the previous BIOMA conferences organized in 2004, 2006 and 2008 as part of the Information Society Multiconference, BIOMA starts its own way this year. It continues its mission of bringing together theoreticians and practitioners to present their recent achievements and exchange the ideas, and promoting the bioinspired optimization methods to wider audience.

Each paper submitted to the conference was reviewed by three members of the international program committee. In the reviewing procedure, 18 papers were selected for presentation at the conference and publication in the proceedings. They were contributed by 40 (co)authors coming from 9 countries.

The BIOMA 2010 invited speaker is Christian Blum, a research fellow at the Technical University of Catalonia, Barcelona, Spain. He has contributed to the fields of swarm intelligence and hybridization of metaheuristics. His talk on hybrid metaheuristics reviews recent developments in combining metaheuristics, such as ant colony optimization, evolutionary algorithms and variable neighborhood search, with techniques from operations research and artificial intelligence.

Theoretical and algorithmic studies presented at the conference address a variety of issues in bioinspired optimization: parallelization of the differential evolution algorithm, analysis of exploration and exploitation in evolutionary algorithms, component decomposition in parallel differential evolution, a distinct candidate approach to multiobjective optimization, parameter estimation in a cell regulatory system model with bioinspired optimization algorithms, a slow feature analysis approach to the analysis of nonstationary time series, and a self-organizing cognitive architecture. The applied work reports come from a number of interesting domains: multi-processor system-on-chip design, design optimization in mechanical, electrical and chemical engineering, optimization of a metallurgical production process, optimization of broadcasting in sensor networks, production planning, scheduling of bus transportation staff, online mathematics learning, woody plants model recognition, and variable selection in econometric modeling with stochastic algorithms.

BIOMA 2010 is sponsored by the Slovenian Research Agency. Technical sponsors of the conference are the World Federation on Soft Computing, the Slovenian Artificial Intelligence Society (SLAIS), and the Jožef Stefan Institute.

Our thanks go to the conference sponsors, members of the program and organizing committees, the invited speaker, paper presenters and other participants for contributing their parts to the conference. We wish you an inspiring scientific meeting and a pleasant stay in Ljubljana.

Ljubljana, 6 May 2010

BOGDAN FILIPIĆ AND JURIJ ŠILC

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