Editors' Introduction to the Special Issue on "Bioinspired Optimization"

The possibly changing and uncertain environment attracts and retains the fittest members of biological populations, which accumulate experience and improve, from adapting and competing among themselves. Their material of experience is exchanged and propagated from iteration to iteration according to the laws of nature. Relying on elementary activities of individuals, societies of these biological populations exhibit complex emergent behaviors.

Assemblies of genes, insects, bird flocks, and many other fascinating natural phenomena have been a rich source of inspiration in computer algorithms design for decades. Specifically, optimization is an area where these techniques are studied and exercised with particular practical success.

As a result bioinspired optimization algorithms (evolutionary algorithms, genetic algorithms, evolution strategies, evolutionary programming, genetic programming, ant colony optimization, particle swarm optimization, artificial immune systems, etc.) were designed to overcome the drawbacks of traditional algorithms in demanding application scenarios including those where little, if any, information is available to assist problem solving. The emerging challenges inspire new methods to be delivered and existing ones being introduced for specific tasks.

This special issue of Informatica – an International Journal of Computing and Informatics includes selected extended versions of student papers presented during:

- the Fifth International Conference on Bioinspired Optimization Methods and their Applications (BIOMA 2012) held in Bohinj, Slovenia, on 24–25 May 2012 and
- the Student Workshop on Bioinspired Optimization Methods and their Applications (BIOMA 2014), held in Ljubljana, Slovenia, on 13 September 2014.

After the selection and approval of the reviewing committee, this special issue presents seven valuable contributions. They were contributed by 21 co-authors coming from five countries (Germany, Romania, Slovenia, Turkey, and United Kingdom)

The first paper is entitled *Differential Evolution Control Parameters Study for Self-Adaptive Triangular Brushstrokes* and contributed by Aleš Zamuda and Uroš Mlakar. This work describes a lossy image representation where a reference image is approximated by an evolved image, constituted of variable number of triangular brushstrokes. Experimental results show the viability of the proposed encoding and optimization results with statistical tests that confirm the improved performance with the self-adaptation of the control parameters over the fixed control parameters.

The second paper, *Parallel Implementation of Desirability Function-Based Scalarization Approach for Multiobjective Optimization Problems*, contributed by Okkes Tolga Altinoz, Eren Akca, Asim Egemen Yilmaz, Anton Duca, and Gabriela Ciupriana, presents the results obtained for the parallel CUDA implementation of the previously proposed desirability-based scalarization approach for the solution of the multi-objective optimization problems. The CUDA implemented approach allows for roughly 20 times speedup compared to sequential implementation, provided a suitable number of solutions to be evaluated is given.

The third paper is *Using a Genetic Algorithm to Produce Slogans*, by Polona Tomašič, Gregor Papa, and Martin Žnidaršič. This paper describes a new solution based on the use of linguistic resources and evolutionary computing for invention of slogans. The approach utilizes a tool to check grammatical mistakes in trial solutions. A real case data is also studied, where slogans for Sentinel company are evolved.

The fourth paper, entitled *Comparing Evolutionary Operators and Search Spaces in the Construction of Facial Composites*, by Joseph James Mist, Stuart James Gibson, and Christopher John Solomon, addresses three experiments concerning the use of interactive evolutionary algorithms in the creation of facial composites. The approach was validated by roughly 20 participants using and assessing and it, thereby generating face-spaces, using different search algorithms, and assessing the comparison of different algorithms.

The fifth paper in this special issue is *Heuristics for Optimization of LED Spatial Light Distribution Model*, by David Kaljun, Darja Rupnik Poklukar, and Janez Žerovnik. This work presents a genetic algorithm and several versions of local search heuristics for optimization of a model of LED and secondary lens combination with symmetric spatial light distribution. They give a parameter and mechanisms combination study on the lighting task challenged. The yielding hybrid approach outperformed the standard genetic algorithm, and also outperformed a local search when inspected closely.

The sixth paper is entitled *Implicit and Explicit Averaging Strategies for Simulation-Based Optimization of a Real-World Production Planning Problem* and contributed by Juan Esteban Diaz and Julia Handl. This paper explores the impact of noise handling strategies on optimization performance in the context of a real-world production planning problem. Since the stochastic nature of the fitness values may impact on optimization performance, authors proposed explicit and implicit averaging strategies to address this issue. They show that under increased levels of fitness variability, a hybrid strategy starts to outperform pure implicit and explicit averaging strategies for evaluation of a real-world production planning problem.

Finally, the seventh paper *Data Mining-Assisted Parameter Tuning of a Search Algoritm* contributed, by Jurij Šilc, Katerina Taškova, and Peter Korošec, deals

with the problem of tuning the performance of a meta-heuristic search algorithm with respect to its parameters. The principle challenge here is how to provide meaningful settings for an algorithm, obtained as result of better insight in its behavior. They apply their approach in learning a model for the DASA algorithm and give some conclusions on the suggested parameters tuning based on the knowledge obtained, such as number of ants and the evaporation factor.

We would like to thank the authors of the papers for their individual contributions and all anonymous dedicated reviewers for their criticism and time to help us making final decisions. Without their valuable and strong support, we could not have made this special issue successful.

As Guest Editors, we hope the readers will find the Special Issue interesting and informative, as well as that the papers will stimulate further progress in the field of ¨Bioinspired Optimization¨.

Jurij Šilc
Aleš Zamuda
Guest Editors