

Evolutionary Algorithms — Selected Topics

Ivan Zelinka

Department of Computer Science, Faculty of Electrical Engineering and Computer Science VŠB-TUO

Abstract: This keynote is focused on mutual intersection of interesting fields of research: bio-inspired algorithms, deterministic chaos and complex systems.

The first part will discuss main principles of bio-inspired methods, its historical background and its use on various examples including real world ones. Examples include plasma reactor control, optimal signal routing in the network of portable meteorological stations, complex system design as antenna design, nonlinear system and controllers design and more. Also its use on deterministic chaos control with focusing on simple chaotic systems (logistic, Hennon, ...) as well as CML systems exhibiting spatiotemporal chaos will be mentioned and explained.

The second part will discuss use of deterministic chaos instead of pseudo-random number generators inside evolutionary algorithms with application on well known evolutionary algorithms (differential evolution, PSO, SOMA, genetic algorithms, ...) and test functions. Mutual comparison will be presented, based on our research. Also will be discussed question whether evolutionary dynamics really need pseudo-random numbers.

At the end will be mentioned a novel approach joining evolutionary dynamics, complex networks and CML systems exhibiting chaotic behavior. Reported methodology and results are based on actual state of art (that is a part of this tutorial) as well as on our own research.

Ivan Zelinka (born in 1965, ivanzelinka.eu) is currently associated with the Technical University of Ostrava (VSB-TU), Faculty of Electrical Engineering and Computer Science. He graduated consequently at the Technical University in Brno (1995 – MSc.), UTB in Zlin (2001 - Ph.D.) and again at Technical University in Brno (2004 – Assoc. Prof.) and VSB-TU (2010 – Professor).



Prof. Zelinka is responsible supervisor of several grant researches of Czech grant agency GAČR as for example Unconventional Control of Complex Systems, Security of Mobile Devices and Communication (bilateral project between Czech and Vietnam) and co-supervisor of grant FRVŠ – Laboratory of parallel computing amongst the others. He was also working on numerous grants and two EU projects as member of team (FP5 – RESTORM) and supervisor (FP7 – PROMOEVO) of the Czech team. He is also head of research team NAVY <http://navy.cs.vsb.cz/>.

Prof. Zelinka was awarded by Siemens Award for his Ph.D. thesis, as well as by journal Software news for his book about artificial intelligence. He is a member of the British Computer Society, Machine Intelligence Research Labs (MIR Labs – <http://www.mirlabs.org/czech.php>), IEEE (committee of Czech section of Computational Intelligence), a few international program committees of various conferences, and three international journals. He is also the founder and editor-in-chief of a new book series entitled Emergence, Complexity and Computation (Springer series 10624, see also www.ecc-book.eu).