# Zbornik povzetkov delavnic “Algoritmi po vzorih iz narave” v študijskem letu 2010/2011

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**Ljubljana, september 2011**



Delavnice organizirajo:

- Odsek za inteligentne sisteme, Institut »Jožef Stefan«, Ljubljana
- Odsek za računalniške sisteme, Institut »Jožef Stefan«, Ljubljana
- Laboratorij za računalniške arhitekture in jezike, Fakulteta za elektrotehniko, računalništvo in informatiko, Univerza v Mariboru, Maribor
- Laboratorij za programirne metodologije, Fakulteta za elektrotehniko, računalništvo in informatiko, Univerza v Mariboru, Maribor

Postavitev in prelom: Gregor Papa

Zbornik izdaja: Institut »Jožef Stefan«, Ljubljana
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## Kazalo







# 1. delavnica

## Maribor, 1. marec 2011

| | |
|---|---|
| 9:00 - 9:45 | *Peter Korošec (IJS)*<br>Who cares about implementation and precision? |
| 9:45 - 10:30 | *Lucas Benedičič (IJS)*<br>Pilot power optimization in UMTS: a multi-agent approach |
| 10:30 - 11:15 | *Dejan Hrnčič (FERI)*<br>Uporaba memetskega algoritma pri načrtovanju domensko specifičnega jezika |
| 11:15 - 12:00 | *Borko Bošković (FERI)*<br>Evolucijska arena |
| 12:00 - 13:00 | Kosilo in razprava |

## Peter Korošec (IJS):
### *Who cares about implementation and precision?*

In this work we investigate the influence of different software implementations of the same algorithm on the quality in a numerical optimization process. The "DE/rand/1/bin" strategy of Differential Evolution algorithm is used as the case study and implemented in Java, Matlab, and C code. For evaluation purposes benchmark suite provided for the CEC'2008 special session on high-dimensional real-parameter optimization is used. It is established that there can be potentially non-negligible differences between different implementations.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_107/AVN2010.ppt*

## Lucas Benedičič (IJS):
### *Pilot power optimization in UMTS: a multi-agent approach*

In the context of coverage planning and control, the power of the CPICH signal determines the coverage area of the cell. It also impacts the network capacity, and thus the quality of service. Pilot power is the parameter that allows us to control the strength of the CPICH signal. A higher power for pilot signals means better coverage. On the other hand, more pilot power translates in less power available to serve user tra-ffic. We consider the problem of minimizing the total amount of pilot power subject to a full coverage constraint. Our solution approach, based on multiple autonomous agents, gives very good solutions to the problem within an acceptable amount of time. We report the results of our experiments for three UMTS networks of different sizes based on realistic planning scenarios.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_108/slides_SLO.pdf*

*https://labraj.uni-mb.si/avn/src/article_108/text_reduced.pdf*





## Dejan Hrnčič (FERI):
### *Uporaba memetskega algoritma pri načrtovanju domensko specifičnega jezika*

Predstavil bom memetski algoritem za sklepanje o gramatikah. Memetski algoritmi so evolucijski algoritmi z vključenim lokalnim iskanjem. Področje sklepanja o gramatikah pa se ukvarja z iskanjem strukture/gramatike iz množice primerov/programov neznanega jezika. Algoritem smo poimenovali MAGIc (Memetic Algorithm for Grammatical Inference). Preizkusili smo ga za izpeljavo gramatik kratkih domensko specifičnih jezikov (DESK, FDL, ...). Predstavil bom tudi dobljene rezultate, (trenutne) omejitve algoritma in nadaljnje izboljšave/delo.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_109/AVN2010-Hrncic.pptx*

## Borko Bošković (FERI):
### *Evolucijska arena*

Predstavljen bo program Evolucijska arena. Namen programa je testiranje evolucijskih algoritmov. Obstoječe probleme s CEC tekmovanja, v obliki deljenih knjižnic, smo nadgradili in definirali protokol za komunikacijo med grafičnim vmesnikom in evolucijskim algoritmom. Izdelali smo prototipmo aplikacijo, ki vsebuje grafični vmesnik. Pri implementaciji smo uporabili knjižnico Qt. Tako izdelana aplikacija omogoča preizkušanje različnih evolucijskih algoritmov s pomočjo različnih problemov, je uporabniku prijazna in neodvisna od platforme.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_110/predstavitev.pdf*

## 2. delavnica

## Ljubljana, 13. september 2011

9:00 - 9:45 *Matej Črepinšek (FERI)*
Kateri je najboljši v deželi tej?

9:45 - 10:30 *Tea Tušar (IJS)*
Using prosections for visualizing 4D approximation sets

10:30 - 11:15 *Iztok Fister (FERI)*
Ali lahko uporabimo diferencialno evolucijo za 3-barvanje grafov?

11:15 - 12:00 *Gregor Papa (IJS)*
Poročilo s konference CEC 2011

12:00 - 13:00 Kosilo in razprava

## Matej Črepinšek (FERI):
## *Kateri je najboljši v deželi tej?*

Eden izmed najnovejših evolucijskih algoritmov je algoritem TLBO (Teaching Learning Based Optimization) [1]. Po navajanju avtorjev velja algoritem za enostavnejšega in učinkovitejšega od uveljavljenih algoritmov, kot so M-ES (Multimembered Evolutionary Strategy), PESO (Particle Evolutionary Swarm Optimization), CDE (Cultural Differential Evolution) in ABC (Artificial Bee Colony). Analiza navedenega pristopa je pokazala različne nepravilnosti pri interpretaciji rezultatov, pomanjkljivosti pri opisu algoritma in celo napake pri podajanju testnih primerov. Podobno mnoge metode, ki so navedene kot uspešne, skrivajo različne pomisleke oz. pasti, saj so avtorji skoraj po pravilu premalo kritični do svojih pristopov. Nadalje se odpira vprašanje o potrebi po raznolikosti kriterijev za rangiranje različnih evolucijskih pristopov.

[1] R. V. Rao , V. J. Savsani, D. P. Vakharia. Teaching–learning-based optimization: A novel method for constrained mechanical design optimization problems. Computer-Aided Design 43 (2011), 303-315.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_112/AVNPredstavitev.ppt*





## Tea Tušar (IJS):
## *Using prosections for visualizing 4D approximation sets*

In ideal multiobjective optimization, the result produced by an optimizer is a set of nondominated solutions approximating the Pareto optimal front. Visualization of this approximation set can help assess its quality as well as present various features of the problem. Most often, scatter plots are used to visualize 2D and 3D approximation sets, while no scatter plot equivalent exists for visualization in higher dimensions. We present a method for visualizing 4D approximation sets which performs dimension reduction using prosections (projections of a section). The method yields a prosection matrix—a matrix of intuitive 3D scatter plots that well reproduce the shape, range and distribution of vectors in the observed approximation set and can preserve the dominance relation. The performance of visualization with prosections is analyzed and demonstrated on two examples with approximation sets of state-of-the-art test optimization problems.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_113/Tusar2011_ProsectionsGecco.pdf*

*https://labraj.uni-mb.si/avn/src/article_113/Tusar2011_ProsectionsSlides.pdf*

## Iztok Fister (FERI):
### *Ali lahko uporabimo diferencialno evolucijo za 3-barvanje grafov?*

In this presentation we post the question if differential evolution (DE), knowing for good results by solving the continuation optimization problems (like function optimization), can be used by solving of combinatorial optimization problems (like graph 3-coloring) as well. In line with this, a comparison of some existing algorithms for graph 3-coloring with a differential evolution for graph 3-coloring (HSA-DE) was performed. The results showed that HSA-DE was better than evolutionary algorithm with method SAW (SAW-EA) but worse than the best known existing algorithms (like HEA, Tabucol and HSA-EA). Finally, the possible causes for the worse results were exposed, and simultaneously, directions for their improvements were proposed.

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_114/AVN-2011.pptx*





## Gregor Papa (IJS):
### *Poročilo s konference CEC 2011*

Letošnji kongres o evolucijskem računanju CEC 2011 je potekal od 5. do 8. junija 2011 v New Orleansu v ZDA. Na programu je bilo deset tutorialov: Introduction to Evolutionary Computation (Daniel Ashlock); Parallel and Distributed Evolutionary Algorithms (El-Ghazali Talbi); A Survey of Representations for Evolutionary Algorithms (Daniel Ashlock); Applying Computational Intelligence - How to Create Value (Arthur Kordon); Molecular Biology for Computational Scientists (Wendy Ashlock); Industrial Applications of Evolutionary Algorithms (Giovanni Squillero); Computational Intelligence and Games (Julian Togelius and Simon Lucas); Medical Applications of EC (Stephen Smith); Incorporating Social Intelligence into Virtual Worlds (Robert G. Reynolds); The Art of Evolutionary Algorithms Programming (J. J. Merelo). Dve delavnici: International Workshop on Distributed Evolutionary Computation in Informal Environments; Evolutionary Music. Ostale dni so bila na vrsti še vabljena plenarna predavanja: Darwin's Magic : Evolutionary Computation in Nanoscience, Bioinformatics and Systems Biology (Natalio Krasnogor); Computer Aided Algorithm Design : Automated Tuning, Configuration, Selection and Beyond (Holger H. Hoos); Analysis by Synthesis (Hod Lipson). Sledile so posamezne specializirane sekcije; skupno jih je bilo 45. V okviru sekcije Hardware Aspects of Bio-Inspired Architectures and Systems je bil predstavljen prispevek: Optimal On-Line Built-In Self-Test Structure for System-Reliability Improvement (Gregor Papa, Tomasz Garbolino). V okviru tekmovanja: Testing Evolutionary Algorithms on Real-world Numerical Optimization Problems pa prispevek The Continuous Differential Ant-Stigmergy Algorithm Applied to Real-World Optimization Problems (Peter Korošec, Jurij Šilc).

Gradivo na spletu:

*https://labraj.uni-mb.si/avn/src/article_115/AVN-Papa.pptx*