



Session 3 Posters Overview

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Overview

- What follows is my **highly personal** grouping of papers into themes
- Deliberately orthogonal to the groupings we used within the proceedings.
- Authors may well disagree 😊

Improvements to methodology

How to Assess Step-Size Adaptation Mechanisms in Randomised Search

- Challenges existing methodology for assessing the mechanism used for adapting step sizes
- Focussing on diversity within, rather than shape of, offspring distribution
- Simple set of results is enough to highlight some limitations of current approaches

Reevaluating Exponential Crossover in Differential Evolution

- Shows that problems with benchmark methodology has biased our thinking
 - “Default” choice of operator has a bias that happens to suit peculiarities of some functions
 - Akin to positional bias in combinatorial space
 - Show that simply using a random permutation of variable positions leads to inferior performance

Multi-objective Quadratic Assignment Problem instances generator with a known optimum solution

- QAPs are an important application for metaheuristics
 - Hence interest in test case generators
- New method for:
 - Creating QAP with known solutions
 - That are large and difficult to solve
 - Combining them to create MO-QAPs

Optimized Approximation Sets for Low-dimensional Benchmark Pareto Fronts

- Benchmark functions important in designing EAs (and other heuristics)
 - Single Objective: Need to know optimum,
 - MO? – need to optimal Pareto front
 - Best approximation will depend on cardinality
- Paper presents algorithm and results for the DTLZ functions in 2 and 3 dimensions
 - Will allow more principled evaluation of algorithms
 - Absolute rather than relative values.

Cross fertilisation of ideas

On low complexity Acceleration Techniques for Randomized Optimization

- New low complexity randomised search methods use an $O(n)$ “drift” term.
- Paper relates this to use of evolution path in CMA-ES $O(n^2)$
- Hybrid method produces promising results on the simple problems tested

Combining Model-Based EAs for Mixed-Integer Problems

- EDAs typically apply to either combinatorial or continuous domains
- What are the issues when integrating them for MI problems?
 - Scalability?
 - Rate at which models are exploited?
 - How to avoid premature convergence in one of the model spaces?
- **Some good results... and lots of interesting questions**

Generic Postprocessing via Subset Selection for Hypervolume and Epsilon-Indicator*

- Most MOEAs maintain an archive
 - but just return the final population
- This paper presents a neat post-processing method for mining the archive as well
 - Optimise for either hypervolume or ϵ -indicator
 - No extra function evaluations needed
 - Try with 4 well known algorithms
 - On 10 standard test, and a real-world problem
 - Results show significant improvements on virtually every measure

Racing Multi-Objective Selection Probabilities

- Racing methods have proven very useful in parameter tuning
 - Principled decisions between choices which have stochastic effects
 - Decide as soon as there is statistical evidence
- Same situation arises in noisy MO problems
 - Paper neatly borrows the ideas to reduce number of evals during selection in NSGA II

Randomized Parameter Settings for Heterogeneous Workers in a Pool-Based Evolutionary Algorithm

- How to choose parameters for heterogenous distributed EAS?
 - P_m , P_c , size and length of mini-epoch,
- **At Random!**
 - On P-Peaks problem performs just as well as other parameterisation approaches
- Q: Is this is because of the flexibility of the EvoScape metaphor?

Putting EAs to work ...

On the Use of Evolution Strategies for Optimization on Spherical Manifolds

- ES extensively studied in Euclidean space
 - Especially in spherical problems
- Recent very successful applications to other types of spaces e.g., Riemann manifolds
 - But some odd results noted
- Theoretical model shows:
 - Progress rate, and
 - self-adaptive behaviour
 - break down for larger step-sizes,
 - which is confirmed by experiment
- **Most important – theoretical models provide clues on how to avoid this degenerate behaviour**

Bent Function Synthesis by Means of Cartesian Genetic Programming

- Bent = non-linear Boolean functions
 - Vital application in cryptography to generate hard-to-break keys
 - Bent functions are very hard to find
- Authors show they can be discovered via CGP
 - With benefits of inherent parallelism
 - Up to 16 variables cf. 8 for GA-based approach

Evolving Neural Network Weights for Time-Series Prediction of General Aviation Flight Data

- “General” Aviation is most accident prone
 - So more important to have good predictive models of anomalous flight behaviour
 - Huge database of flight recordings
- Authors tested predictive ability of 3 different types of ANN trained by Backprop or DE.
 - Very extensive experiments
 - DE far superior, especially at some predictions
 - Results could save money... or lives

Scheduling the English Football League with a Multi-objective Evolutionary Algorithm

- Scheduling matches over the busy New Year period (92 teams, 2/4 matches)
- Seven objectives (distance, policing, ...)
- Sophisticated genotype-phenotype mapping
- Results similar to CPLEX for 2 matches, but better for 4.

- **Q: could it lead to the first league title in 25 years for Liverpool?**