Poster Session

Chair: Rasmus K. Ursem

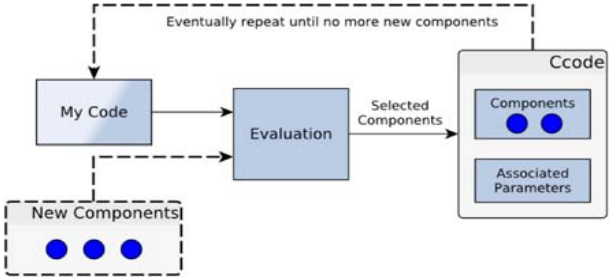
6

Towards a Method for Automatic Algorithm Configuration: A Design Evaluation using Tuners

Elizabeth Montero and María-Cristina Riff

Metaheuristic Design Problem (MDP)

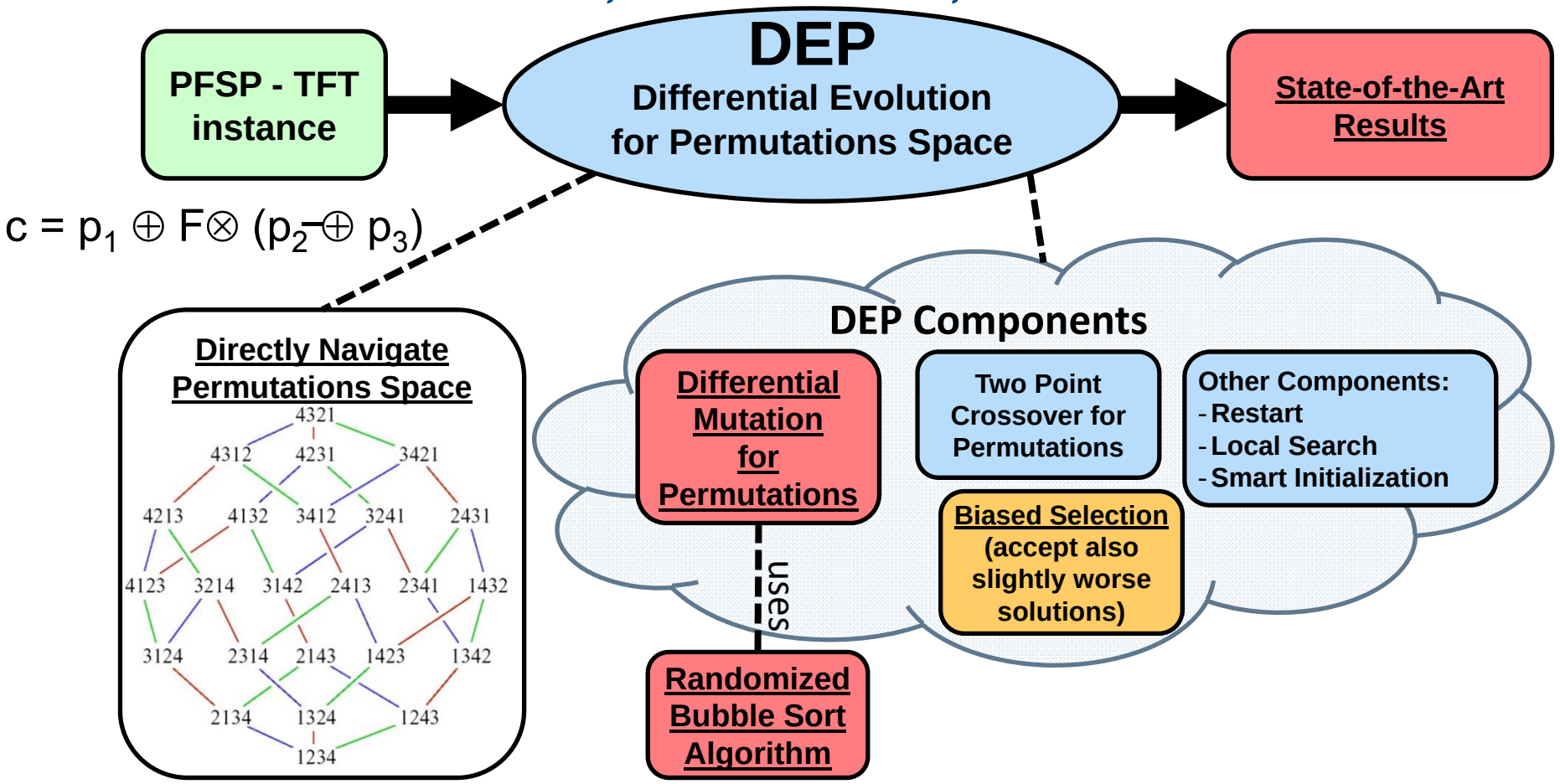
- Selecting and tuning the best components (operators).
- Two approaches:
  - **On-the-fly MDP** – concurrent selection and tuning of components (dashed lines).
  - **Refining MDP** – run algorithm with many components then, in post-processing, reduce to minimal set without performance loss.



- Two tuners operating on two heuristics:
  - Tuners: I-Race and EVOCA
  - Heuristics: NK-GA, MOAIS-HV (aritificial immune system)
  - Problems: NK-landscapes, ZDT1-4, ZDT6 (multiobjective)

A Differential Evolution Algorithm for the Permutation Flowshop Scheduling Problem with Total Flow Time Criterion

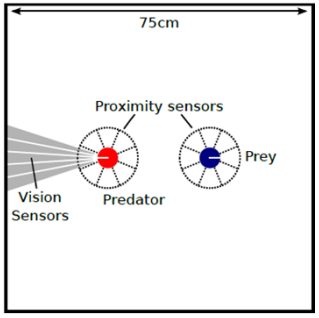
Valentino Santucci, Marco Baioletti, and Alfredo Milani

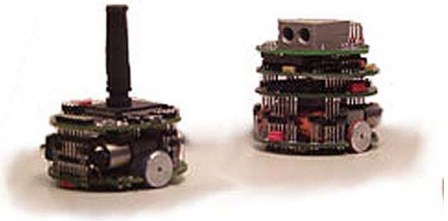


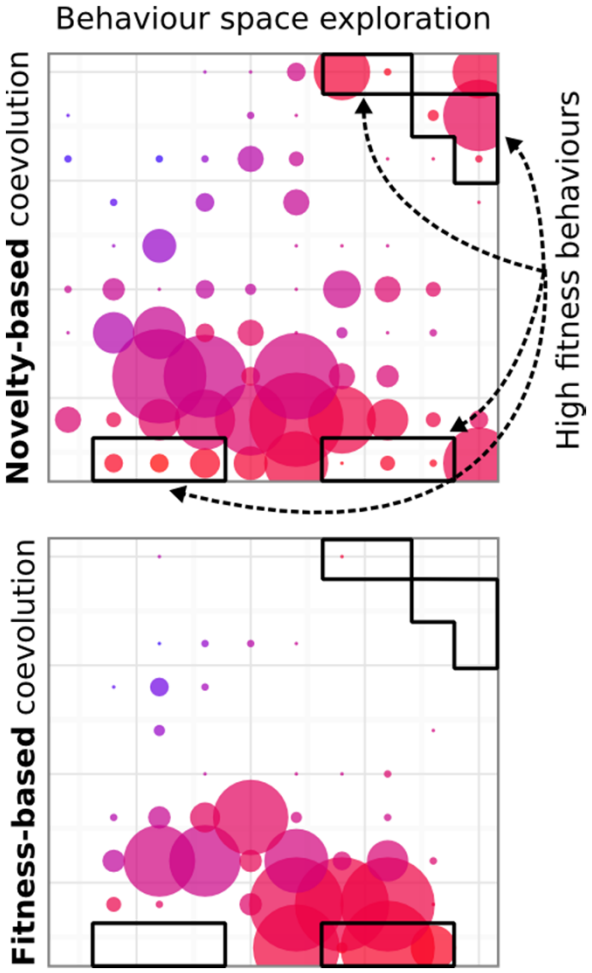
Novelty Search in Competitive Coevolution

Jorge Gomes, Pedro Mariano, and Anders Lyhne Christensen

- Competitive coevolution algorithms rely on the **arms-race** between the competing species.
- **Fitness-based search** often lacks this arms race, but exhibits an **over-adaption** to the other species resulting in a mediocre stable state.
- **Novelty search** – evolution guided towards behavioral novelty – can be used to overcome this convergence.
- **Goal**: Promote diversity of solutions in competitive coevolution.
- Test problem – simulated predator-prey.



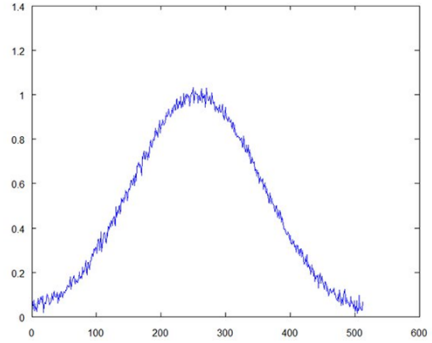




On the Effectiveness of Sampling for Evolutionary Optimization in Noisy Environments

Chao Qian, Yang Yu, Yaochu Jin, and Zhi-Hua Zhou

What to do if the fitness function is noisy?

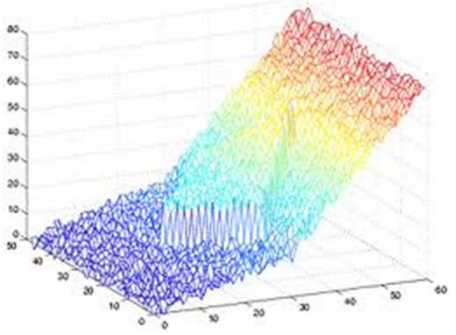


Should we sample the fitness many times?

- A natural answer is “Yes!”, sampling-and-averaging can improve the accuracy of fitness estimation.

What about the overall optimization performance?

- Sampling is not free.
- Resource cost is what we really care about.



Is sampling a noisy problem helpful?

- Effect of sampling in the (1+1)-EA via running time analysis is investigated on the OneMax and Trap problems.

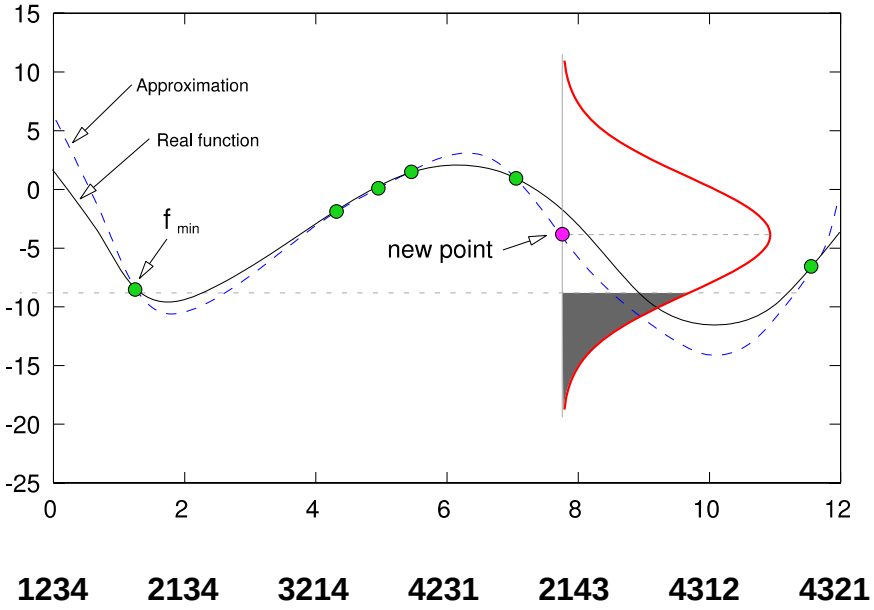
Distance Measures for Permutations in Combinatorial Efficient Global Optimization

Martin Zaefferer, Jörg Stork, and Thomas Bartz-Beielstein

Efficient Global Optimization (EGO)

- Uses Kriging's prediction error to optimize for best resource investment, i.e. *"what solution has highest expected improvement?".*
- Introduced for numerical problems in 1998 – now also available for permutation problems.
- Main challenge is to select the right distance metric.
- 14 metrics were compared on 18 test problems.

EGO on an 1D numerical problem



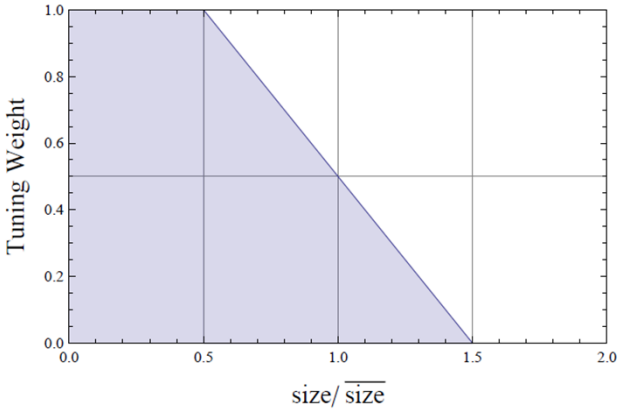
EGO on permutation problems "x-axis" is now distance between permutations

On Effective and Inexpensive Local Search Techniques in Genetic Programming Regression

Fergal Lane, R. Muhammad Atif Azad and Conor Ryan

GP with local search

- Based on *Chameleon* GP system
  - Local search = try all alternatives of a node.
  - More local search effort on smaller trees.
  - Nodes in an average size tree will have 50% probability of tuning.
- The authors investigate search strategies.
  - Exhaustive tuning of all nodes.
  - Different ways to calculate tree size.
  - Different slopes of tuning probability.
  - More tuning in earlier runs.
  - Adding constant nodes.
- Tests on 16 problems (11 artificial, 5 real-world).



Combining Semantically-Effective and Geometric Crossover Operators for Genetic Programming

Tomasz P. Pawlak

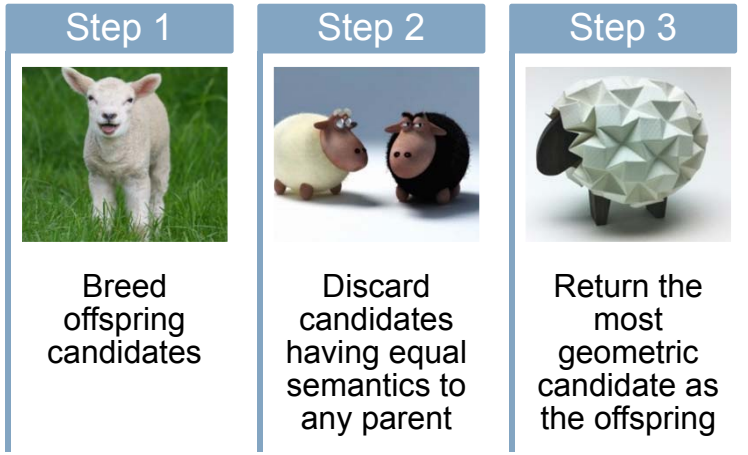
Two general patterns in designing semantic crossover operators in GP:

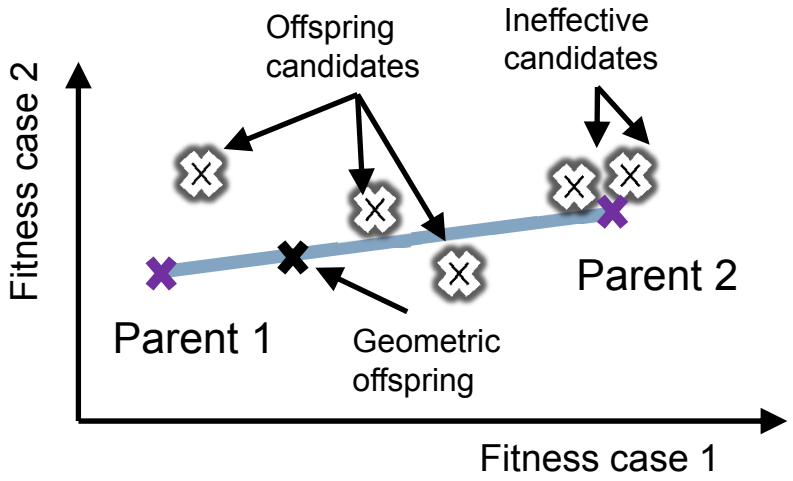
- Effectiveness: the offspring is to be semantically different to its parents
- Geometricity: the offspring bred is to be a certain geometric combination of its parents.

General idea

- Extend an existing geometric crossover with a procedure that prevents from breeding of semantically equal offspring to any of their parents.

Tests on 18 commonly used benchmarks.



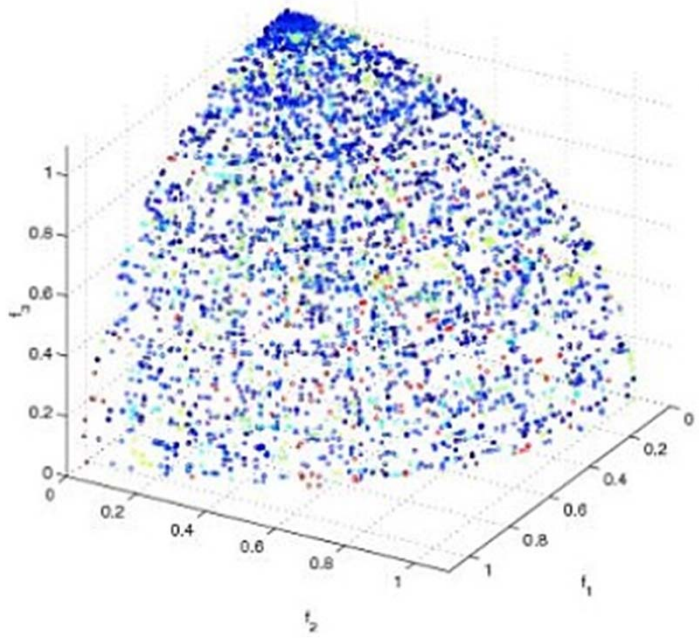


An Analysis on Selection for High-Resolution Approximations in Many-objective Optimization

Hernán Aguirre, Arnaud Liefooghe, Sébastien Verel, and Kiyoshi Tanaka

General idea

- Introduces *resolution* as an extra performance metric for many-objective optimization.
- Algorithms should be able to provide high resolution of Pareto Optimal Set.



Study

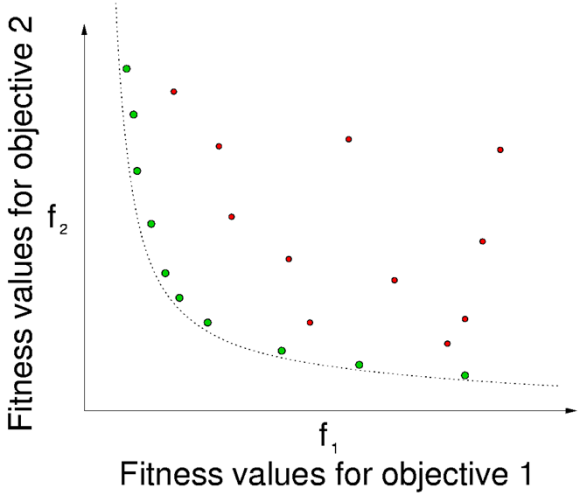
- Two types of metrics for measuring resolution.
  - Accumulated number of PO solutions found.
  - Generational search assessment indices.
- Comparison of NSGA-II, IBEA , and AεSεH (Adaptive ε-Sampling and ε-Hood).
- Applied to four MNK-landscapes with M=3,4,5,6.

Queued Pareto Local Search for Multi-Objective Optimization

Maarten Inja, Chiel Kooijman, Maarten de Waard, Diederik M. Roijers, and Shimon Whiteson

General idea

- *Repeat until queue is empty*
  - Pick a solution from the queue.
  - Perform a Pareto Local Search on it.
  - Add incomparable neighboring solutions to queue.



Variants

- Add new starting points to queue by the use of genetic operators.

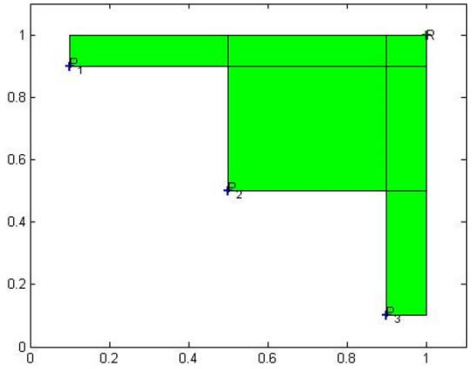
- Tested on multiobjective coordinate graphs problems.
  - Agents must work together to obtain a shared reward.
  - Real-world examples: Resource gathering, risk-sensitive combinatorial auctions, and transport network maintenance planning.

Empirical Performance of the Approximation of the Least Hypervolume Contributor

Krzysztof Nowak, Marcus Märtens, and Dario Izzo

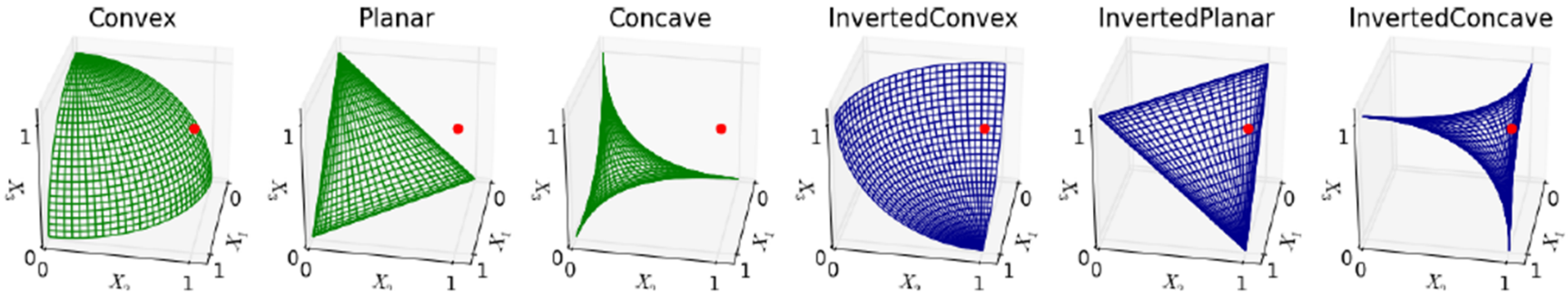
Background

- Fast computation of hyper-volume is crucial for many-objective problems.
- Currently, this is expensive for many-objective problems.
- A simplification is to find the least contributing individual.
- This can be approximated at the cost of precision.



This study

- Runtime performance for 2-100 objectives on the examples below



An Analysis of Migration Strategies in Island-Based Multimemetic Algorithms

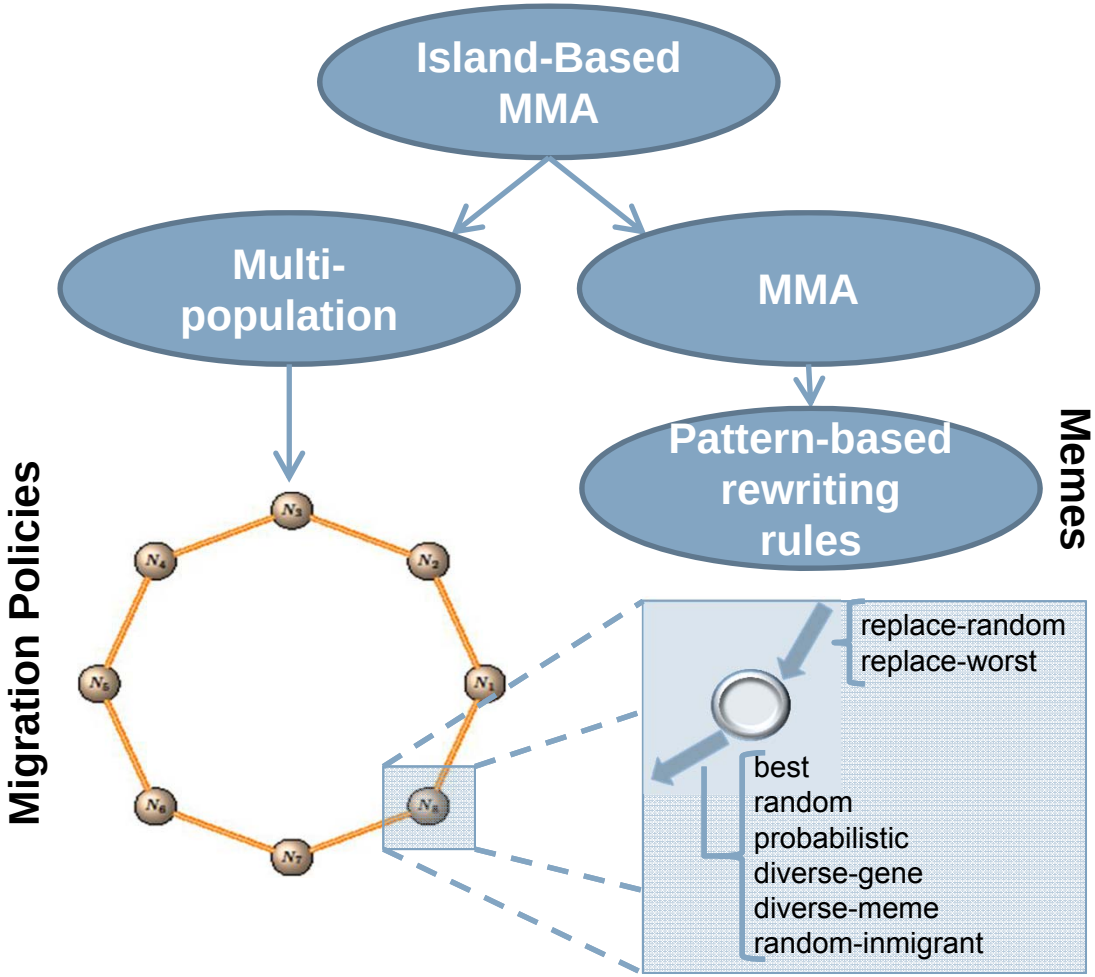
Rafael Nogueras and Carlos Cotta

Background

- Memes evolve with the solutions and conduct the search process in a self-adaptive way.

This study

- Analysis of migration policies on an island-based model of MMA.
- Experimental analysis on four test problems.
- Selection strategy is decisive for the performance of MMA.



Multiobjective Selection of Input Sensors for SVR Applied to Road Traffic Prediction

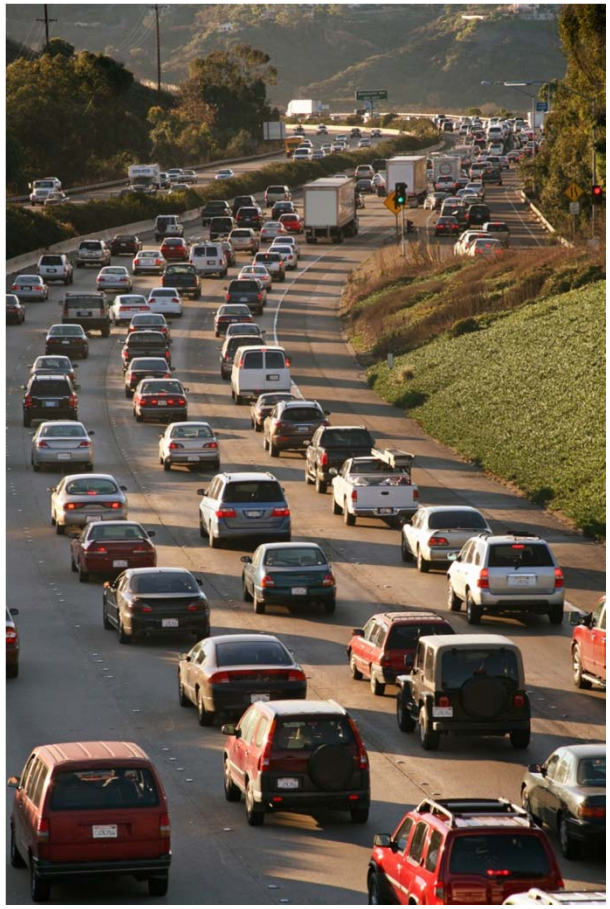
Jiri Petrlik, Otto Fucik, Lukas Sekanina

Background

- Traffic sensors can measure flow, occupation (traffic density), and average speed.
- Sensors are not 100% reliable or accurate.
- Some measurements can lead to incorrect data and suboptimal traffic prediction and control.

This study

- Support vector regression model for short-term traffic prediction.
- NSGA-II is used for selecting the subset of sensors to use in prediction and predicting the values.
- Data from Seattle in 2011 with 23 sensors.



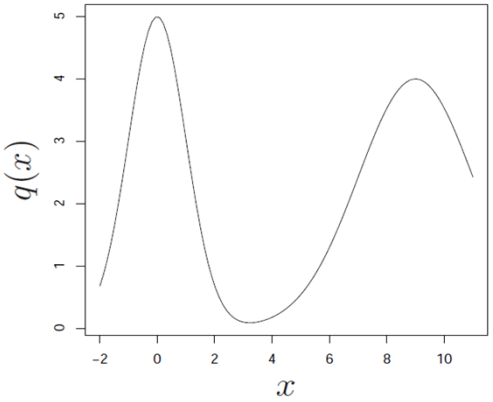
Quasi-Stability of Real Coded Finite Populations

Jarosław Arabas, Rafał Biedrzycki

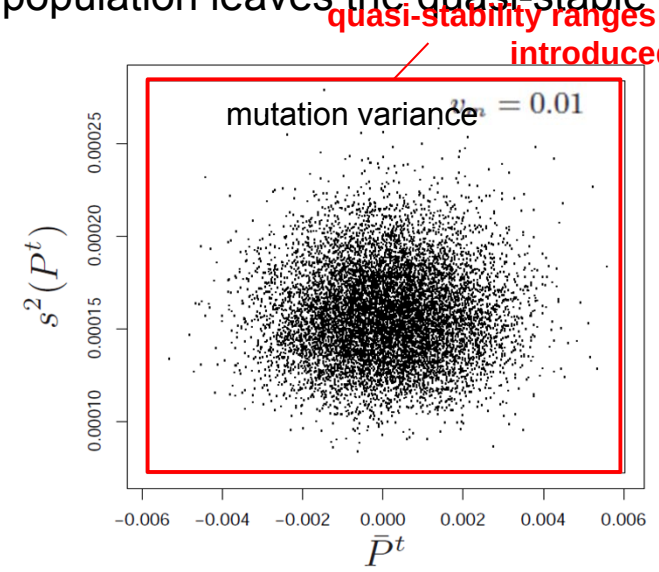
Q: When the EA will start exploration?

- Population state is characterized by mean and variance of chromosomes positions.
- Quasi-stable state when the population stays at the predicted location in next generation.
- Exploration is when the population leaves the quasi-stable state.

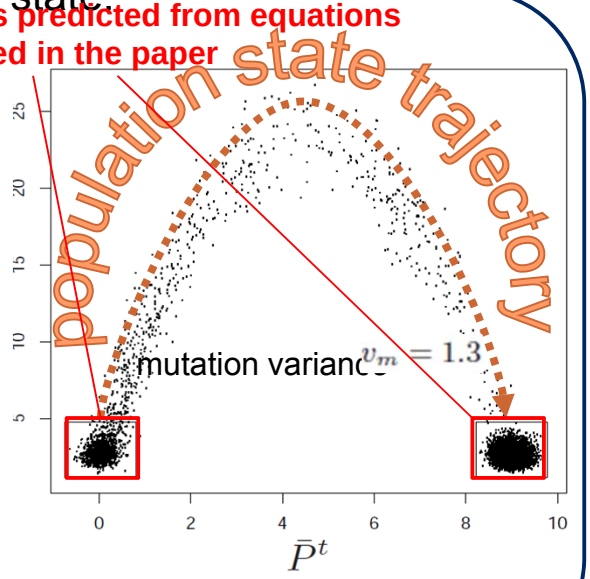
- Binary tournament selection, no crossover, Gaussian mutation population size: 100
- Simulation of 10000 generations



considered fitness function



all populations in the same quasi-stability (q.-s.) range



escape from one q.-s. range and settlement in the other

Enjoy the session!