Adaptive Evolutionary Computation

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Objective

To improve the applicability of Evolutionary Algorithms (EAs) to e-Sciences, to better support this field's constant development.

How?

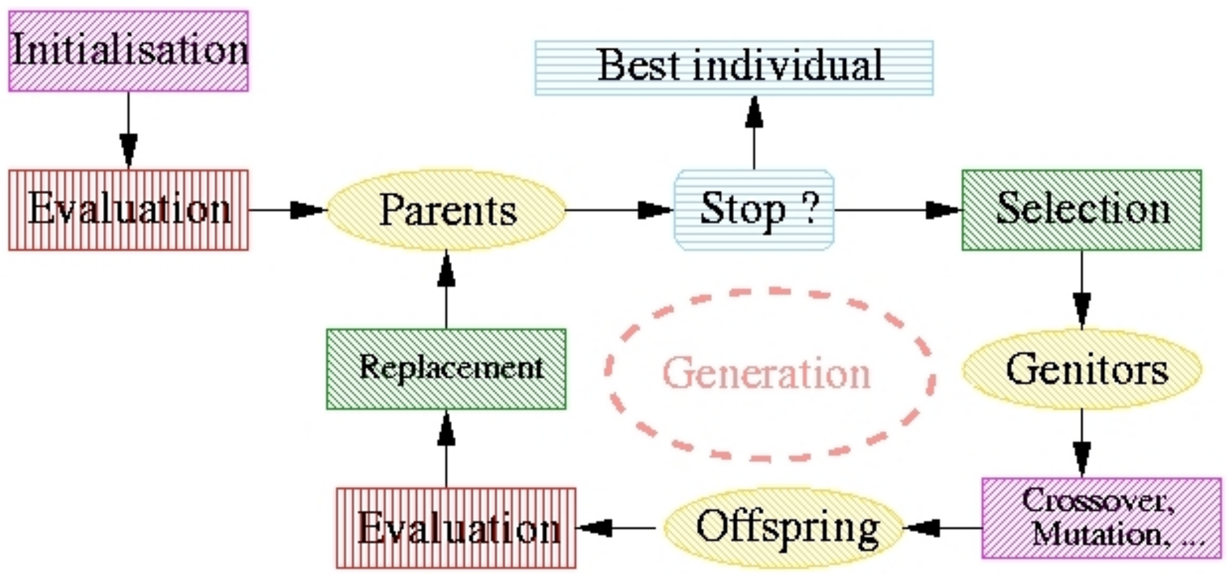
Developing EA approaches which are able to automatically set-up their parameters, according to the characteristics of the problem or class of problems.

Why?

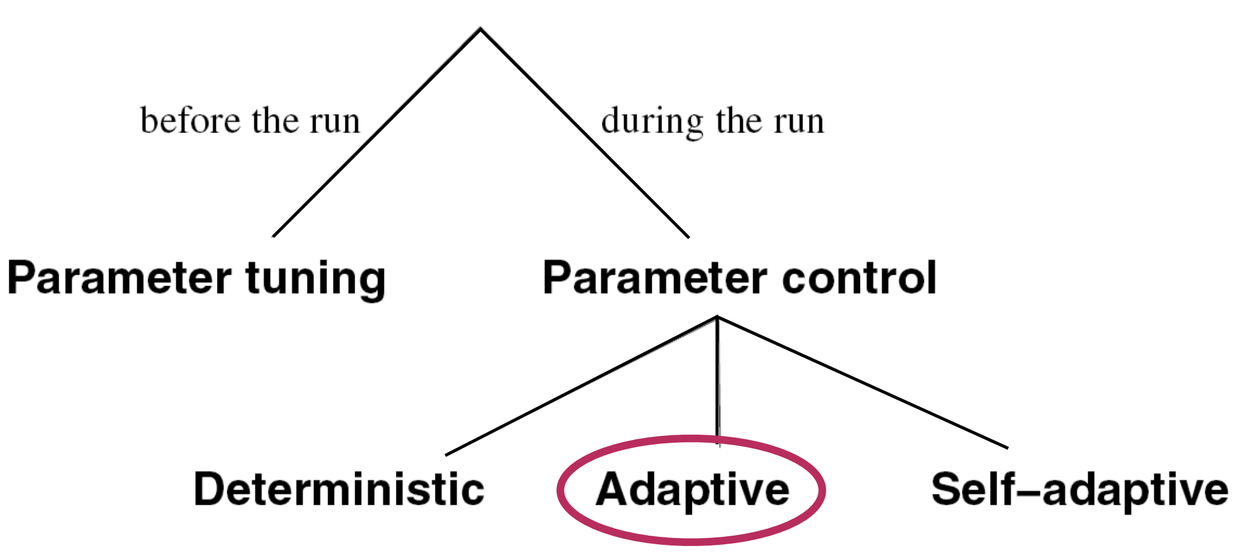
For each new problem/field, there is always the need of fine tuning the EA parameters to achieve good performance.

- Tedious and time-consuming task;
- Requires knowledge about the domain and about the algorithm.
- Hardly applicable to e-Science, as application fields are constantly growing.

Evolutionary Algorithms



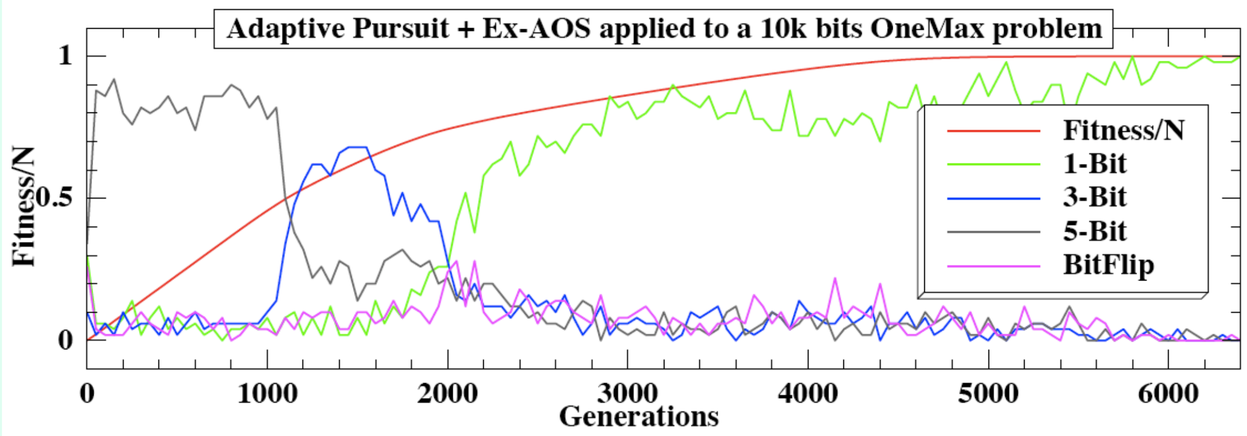
Parameter Setting in EAs



Adaptive Operator Selection (AOS)

Goal: select on-line the (meta-)operator that maximizes the (expectation of) fitness improvement. Such procedure is made of:

- an Adaptation rule: in [1], the Dynamic Multi-Armed Bandit (D-MAB) is proposed and compared against the current state-of-the-art Adaptive Pursuit (AP) in artificial scenarios.
- a Credit Assignment rule: in [2], the EXtreme value-based AOS (Ex-AOS) is proposed, in which extreme fitness gains are taken into account instead of the usual average gains.



Future Perspectives

- Analyze the developed AOS combinations in other well-known benchmark functions (e.g. k-Path, nk-Landscape);
- Refine the credit assignment rule, e.g. use a rank-based assignment;
- Possibly use the extreme fitness gains to adapt online the λ parameter in (1+λ)-EAs.

Bibliography Produced

[1] Luís Da Costa, Álvaro Fialho, Marc Schoenauer and Michèle Sebag. *"Adaptive Operator Selection with Dynamic Multi-Armed Bandits"*. In: Proc. GECCO 2008 (to appear).

[2] Álvaro Fialho, Luís Da Costa, Marc Schoenauer and Michèle Sebag. *"Extreme Value Based Adaptive Operator Selection"*. In: Proc. PPSN 2008 (to appear).

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