Indicator-based evolutionary Algorithm

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Outline

- Black-box Multi-objective optimization motivation
- IBEA setting and presentation
- Implementation & Tests
- Discussion

Indicators

General definition of domination relation.

Choice of indicator (and impact).

Fitness function.

Recombination

Different recombination operators.

Choosing a recombination probability.

Goal: control the domain in which offspring is generated.

Definition: Approximate a high-probability stationary 'spread' distribution with two "proxy" distributions

Contracting $c(\beta) = 0.5(n_c + 1)\beta^{n_c}, \beta \leq 1$

Expanding $e(\beta) = 0.5(n_c + 1)\frac{1}{\beta^{n_c+2}}, \beta > 1$

Distribution index: $n_c \in \mathbb{N} \implies$ find optimal value?

Variation operators

Adaptating the step-size: essential to find targets **fast**.

Low mutation probability

Results

Show where the algorithm is good (comparatively to other approaches).

Explain where we fail.

Discussion

Online parameter tuning.

Hyper-parameters tuning.

Choice of the indicator function.

Thank you for your attention!

Questions & Answers

Further Reading I

📄 Eckart Zitzler and Simon Künzli, "Indicator-Based Selection in Multiobjective Search". In Parallel Problem Solving from Nature (PPSN 2004), pp. 832-842, 2004.

📄 Deb, Kalyanmoy, and Ram B. Agrawal. "Simulated binary crossover for continuous search space." Complex Systems 9.3 (1994): 1-15.