Revisiting Simulated Annealing: a Component-Based Analysis

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Simulated Annealing can be divided into seven basic components. It takes in input two additional problem-specific components.

In the literature we can find thousands of works about/using SA; in many of them we find several ideas/variants/adaptations that we can collect into algorithmic frameworks and reuse.

Automatic algorithm configuration approach can be naturally expanded into automatic algorithm design.

Starting from the componenets we have implemented in the framework, we can use AAD to:
- improve existing algorithms
- generate new, more powerful algorithms
- study the algorithms in a more scientific way

We use irace as configurator and EMILI as framework. We constrain ourselves to SA by fixing the rules to follow the structure of SA (top-down algorithm generation).

We instantiate ten SA algorithms for the QAP from the literature, tune their numerical parameters and generate new SAs. We report the results obtained on 150 random instances, with default settings, with 10s of runtime, and after the tuning and the generation of new algorithms.

Exp. Setup: 2k budget for tuning the numerical parameters (3-5 for each algorithm), 60k for generation (97 parameters in total), 10s runtime, 15 tunings each exp.

We can perform some analysis. Numerical parameters can differ from the original works. We do observe the impact of some components/choices after the tuning. Acceptance, Neighbourhood exploration are the most important components.

We can also improve the anytime behaviour of the algorithms.