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Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Thomas Stützle Mauro Birattari
Holger H. Hoos (Eds.)

Engineering Stochastic Local Search Algorithms

Designing, Implementing and Analyzing Effective Heuristics

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Thomas Stützle
Mauro Birattari
Université Libre de Bruxelles (ULB)
CoDE, IRIDIA
Av. F. Roosevelt 50, CP 194/6, 1050 Bruxelles, Belgium
E-mail: {stuetzle,mbiro}@ulb.ac.be

Holger H. Hoos
University of British Columbia
Computer Science Department
2366 Main Mall, Vancouver, BC, V6T 1Z4, Canada
E-mail: hoos@cs.ubc.ca

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Preface

Stochastic local search (SLS) algorithms enjoy great popularity as powerful and versatile tools for tackling computationally hard decision and optimization problems from many areas of computer science, operations research, and engineering. To a large degree, this popularity is based on the conceptual simplicity of many SLS methods and on their excellent performance on a wide gamut of problems, ranging from rather abstract problems of high academic interest to the very specific problems encountered in many real-world applications. SLS methods range from quite simple construction procedures and iterative improvement algorithms to more complex general-purpose schemes, also widely known as metaheuristics, such as ant colony optimization, evolutionary computation, iterated local search, memetic algorithms, simulated annealing, tabu search and variable neighborhood search.

Historically, the development of effective SLS algorithms has been guided to a large extent by experience and intuition, and overall resembled more an art than a science. However, in recent years it has become evident that at the core of this development task there is a highly complex engineering process, which combines various aspects of algorithm design with empirical analysis techniques and problem-specific background, and which relies heavily on knowledge from a number of disciplines and areas, including computer science, operations research, artificial intelligence, and statistics. This development process needs to be assisted by a sound methodology that addresses the issues arising in the various phases of algorithm design, implementation, tuning, and experimental evaluation. A similarly principled approach is key to understanding better which SLS techniques are best suited for particular problem types and to gaining further insights into the relationship between algorithm components, parameter settings, problem characteristics, and performance.

The aim of *SLS 2007, Engineering Stochastic Local Search Algorithms — Designing, Implementing and Analyzing Effective Heuristics* was to stress the importance of an integration of relevant aspects of SLS research into a more coherent engineering methodology and to provide a forum for research in this direction. The workshop brought together researchers working on various aspects of SLS algorithms, ranging from fundamental SLS methods and techniques to more applied work on specific problems or real-life applications. We hope that this event will lead to an increased awareness of the importance of the engineering aspects in the design and implementation of SLS algorithms, and that it will help to tie together existing activities and to seed new efforts in this promising research area.

The importance and the timeliness of the topic of SLS engineering is witnessed by the more than 50 submissions we received for this workshop. From these submissions, the 12 full and 9 short papers contained in this volume and

presented at the workshop were chosen based on a highly selective and rigorous peer-reviewing process; each of them reports results of very promising, ongoing research efforts from, or highly related to, the budding area of SLS engineering. The workshop program was complemented by the Doctoral Symposium on Engineering Stochastic Local Search Algorithms, which was organized by Enda Ridge and Edward Curry, and five tutorials on important topics in SLS engineering given by well-known researchers in the field.

We gratefully acknowledge the contributions of everyone at IRIDIA who helped in organizing SLS 2007. Special thanks go to Enda Ridge and Edward Curry for their enthusiasm in organizing the doctoral symposium. We thank all researchers who submitted their work and thus provided the basis for the workshop program; the members of the Program Committee and the additional referees for their help with the paper selection process; the Université Libre de Bruxelles for providing the rooms and logistic support; and, more generally, all those who contributed to the organization of the workshop. Finally, we would like to thank COMP2SYS,[1] the Belgian National Fund for Scientific Research, and the French Community of Belgium for supporting the workshop.

June 2007

Thomas Stützle
Mauro Birattari
Holger H. Hoos

[1] A Marie Curie Early Stage Training Site funded by the European Commission; more information is available at http://iridia.ulb.ac.be/comp2sys.

Organization

SLS 2007 was organized by IRIDIA, CoDE, Université Libre de Bruxelles, Belgium.

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http://iridia.ulb.ac.be/comp2sys

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http://www.fnrs.be

French Community of Belgium (through the research project ANTS)
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