# Preface

With the increasing deployment of planning and scheduling systems, developers often have to deal with very large search spaces, real-time performance demands, and dynamic environments. Complete refinement methods do not scale well, making local search methods the only practical alternative. A dynamic environment also promotes the application of local search, the search heuristics not normally being affected by modifications of the search space. Furthermore, local search is well suited for anytime requirements because the optimization goal is improved iteratively. Such advantages are offset by the incompleteness of most local search methods, which makes it impossible to prove the inconsistency or optimality of the solutions generated. Popular local search approaches include evolutionary algorithms, simulated annealing, tabu search, min-conflicts, GSAT, and Walksat. The first article in this book – an invited contribution by Stefan Voß – gives an overview of these methods.

The book is based on the contributions to the Workshop on Local Search for Planning & Scheduling, held on August 21, 2000 at the 14th European Conference on Artificial Intelligence (ECAI 2000) in Berlin, Germany. The workshop brought together researchers from the planning and scheduling communities to explore these topics with respect to local search procedures. After the workshop, a second review process resulted in the contributions to the present volume.

Voß's overview is followed by two articles, by Hamiez and Hao and Gerevini and Serina, on specific "classical" combinatorial search problems. The article by Hamiez and Hao addresses the problem of sports-league scheduling, presenting results achieved by a tabu search method based on a neighborhood of value swaps. Gerevini and Serina's article addresses the topic that dominates the rest of the book: action planning. It builds on their previous work on local search on planning graphs, presenting a new search guidance heuristic with dynamic parameter tuning.

The next set of articles deal with planning systems that are able to incorporate resource reasoning. The first article, of which I am the author, makes it clear why conventional planning systems cannot properly handle planning with resources and gives an overview of the constraint-based EXCALIBUR agent's planning system, which does not have these restrictions. The next three articles are about NASA JPL's ASPEN/CASPER system. The first one – by Chien, Knight, and Rabideau – focuses on the replanning capabilities of local search methods, presenting two empirical studies in which a continuous planning process clearly outperforms a restart strategy. The next article, by Engelhardt and Chien, shows how learning can be used to speed up the search for a plan. The goal is to find a set of search heuristics that guide the search as well as possible. The last article in this block – by Knight, Rabideau, and Chien – proposes and demonstrates, a technique for aggregating single search moves so that distant states can be reached more easily.

The last three articles in this book address topics that are not directly related to local search, but the described methods make very local decisions during the search. Refanidis and Vlahavas describe extensions to the GRT planner, e.g., a hill-climbing strategy for action selection. The extensions result in much better performance than with the original GRT planner. The second article – by Onaindia, Sebastia, and Marzal – presents a planning algorithm that successively refines a start graph by different phases, e.g., a phase to guarantee completeness. In the last article, Hiraishi and Mizoguchi present a search method for constructing a route map. Constraints with respect to memory and time can be incorporated into the search process.

I wish to express my gratitude to the members of the program committee, who acted as reviewers for the workshop and this volume. I would also like to thank all those who helped to make this workshop a success – including, of course, the participants and the authors of papers in this volume.

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Alexander Nareyek
Workshop Chair

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