Search Methodologies

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Editors

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Introductory Tutorials in Optimization and Decision Support Techniques

Second Edition

Springer

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ISBN 978-1-4614-6939-1 ISBN 978-1-4614-6940-7 (eBook)
DOI 10.1007/978-1-4614-6940-7
Springer New York Heidelberg Dordrecht London

Library of Congress Control Number: 2013944229

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Foreword to the First Edition

This is not so much a foreword as a testimonial. As I embarked on the pleasant journey of reading through the chapters of this book, I became convinced that this is one of the best sources of introductory material on the search methodologies topic to be found. The book's subtitle, "Introductory Tutorials in Optimization and Decision Support Techniques," aptly describes its aim, and the editors and contributors to this volume have achieved this aim with remarkable success.

The chapters in this book are exemplary in giving useful guidelines for implementing the methods and frameworks described. They are tutorials in the way tutorials ought to be designed. I found no chapter that did not contain interesting and relevant information and found several chapters that can only be qualified as delightful.

Those of us who have devoted a substantial portion of our energies to the study and elaboration of search methodologies often wish we had a simple formula for passing along the core notions to newcomers to the area. (I must confess, by the way, that I qualify as a relative newcomer to some of the areas in this volume.) While simplicity, like beauty, to some degree lies in the eyes of the beholder and no universal or magical formula for achieving it exists, this book comes much closer to reaching such a goal than I would have previously considered possible. It will occupy a privileged position on my list of recommended reading for students and colleagues who want to get a taste for the basics of search methodologies and who have an interest in equipping themselves to probe more deeply.

If good books may be likened to ladders that help us ascend to higher rungs of knowledge and understanding, we all know there are nevertheless many books written in technical areas that seem to be more like stumbling blocks or at best broken stepping stools that deposit us in isolated nooks offering no clear access to continued means of ascent. Not so the present book. Its chapters lead to ideal sites for continued exploration and offer compelling motivation for further pursuit of its ideas and frameworks. If my reckoning is not completely amiss, those who read this volume will find abundant reasons for sharing my conviction that we owe its editors and authors a true debt of gratitude for putting this work together.

Boulder, CO, USA — Fred Glover

Foreword to the Second Edition

It gives me great pleasure to write this short foreword to the second edition of this outstanding book. The first edition established this volume as an important international landmark in the exposition and explanation of computational search methodologies and associated issues. As its title indicates, it covers a broad and diverse portfolio of search techniques from an interdisciplinary perspective in an extensive and comprehensive way. In some ways, this is no surprise because the authors that have been brought together in this volume truly represent a collection of the very top figures in the field. It is an extremely impressive group of authors who have the highest possible qualifications to present these chapters in a clear and authoritative way.

As the editors have explained in the Introduction, decision support systems now underpin the core of many modern management approaches in such diverse areas as health care, commerce, industry, science, and government. In many everyday situations across many different working environments, the idea of taking important managerial decisions without some kind of decision support system would be inconceivable. Moreover, it is the techniques and methods that are introduced in this book that often lie at the heart of the search engines upon which these decision support systems depend. Thus, the book ideally fits the current needs of today's increasingly computer-driven world.

The aim of the book is clearly articulated in the Introduction. It aims to present a series of well-written tutorials by the leading experts in their fields. Moreover, it does this by covering practically the whole possible range of topics in the discipline. It enables students and practitioners to study and appreciate the beauty and the power of some of the computational search techniques that are able to effectively navigate through search spaces that are sometimes inconceivably large.

I am convinced that this second edition will build on the success of the first edition and that it will prove to be just as popular. Three main features of the volume add significantly, in my opinion, to its appeal. These can be outlined as follows:

- I have already referred to the set of excellent authors who have written the chapters of the book, but I think that it is worth emphasizing how important this is. All the authors are world-renowned experts in their field.
- There is full and complete coverage of the area of search methodologies. This is complemented in the second edition by additional chapters on Scatter Search, GRASP (Greedy Randomized Adaptive Search Procedures), and Very Large-Scale Neighborhood Search. The choice of these additional chapters was inspired and reflects the ever-changing nature and developing focus of the field.
- I particularly appreciate the uniform approach to the description of topics which originate from such different disciplines as operations research, computer science, mathematics, artificial intelligence, and others. Establishing this common structure across such a large number of authors is testament to the skill and international standing of the editors. Their vision has been realized in an exceptional introductory treatment of the field. I think that tricks of trade, examples, sources of additional information, and the extensive list of appropriate references represent particularly useful resources, and I have regularly directed my own students to them in the first edition. I expect to continue to do so with this new edition. These features particularly add to the usefulness of the book either for self-study or as the basis of a course in the topic.

To summarize, I highly recommend the book for those who require an introduction to the breadth of techniques and approaches that are represented by the field of search methodologies. I have gained a lot of pleasure from reading through this new edition, and I am sure that it will be a valuable resource to teachers, students, and practitioners for many years to come.

Poznan, Poland Jacek Blazewicz

Preface to the First Edition

We first had the idea for this book over 3 years ago. It grew out of a one-day workshop entitled *Introductory Tutorials in Search, Optimization and Decision Support Methodologies (INTROS)*, which was held in Nottingham in August 2003. The aim of the workshop was to deliver basic introductions to a broad spectrum of search methodologies from across disciplinary boundaries. It was supported by the UK Engineering and Physical Sciences Research Council (EPSRC) and the London Mathematical Society (LMS) and was attended by over one hundred delegates from all over the world. We were very fortunate to have 11 of the world's leading scientists in search methodologies presenting a range of stimulating and highly informative tutorials. All of the INTROS presenters have contributed to this volume, and we have enhanced the content by inviting additional, specifically targeted, complementary chapters. We are pleased to be able to present such a comprehensive, multidisciplinary collection of tutorials in this crucially important research area.

We would like to take this opportunity to thank the many people who have contributed towards the preparation of this book. We owe a great debt of gratitude to the authors of the chapters. As one would expect from such a distinguished group of scientists, they have prepared their excellent contributions in a thoroughly reliable and professional manner. Without them, of course, the book would not have been possible. We are extremely grateful to our copy editor, Piers Maddox, who excelled himself in bringing together, in one coherent structure, the various documents that were sent to him. We are also very grateful to Gary Folven, Carolyn Ford, and their staff at Springer who have provided us with invaluable advice and support during every step of the way. We would like to offer our gratitude to Fred Glover for writing the foreword for this book. His warm praise is particularly pleasing. A special thank you should go to Emma-Jayne Dann and Alison Payne for all the administrative support they have given us, both in the preparation of this volume and in the organization of the INTROS workshop that underpinned it. We are also very thankful to EPSRC and LMS for the financial support they gave us to hold this workshop. Finally, we offer a special thank you to the INTROS delegates for their enthusiasm and their encouragement.

We hope you enjoy reading this volume as much as we have enjoyed putting it together. We are already planning a second edition, and if you have any comments which can help us improve the book, please do not hesitate to contact us. We would welcome your advice.

Nottingham, UK — Edmund K. Burke
Nottingham, UK — Graham Kendall

Preface to the Second Edition

The first edition of this book, which appeared in 2005, grew out of a 1-day workshop entitled Introductory Tutorials in Search, Optimization and Decision Support Methodologies (INTROS), which was held in Nottingham, UK, in August 2003. It had 19 chapters which gave broad coverage of the predominant search methodologies at the time.

This second edition contains updated versions of the chapters, and we have also included three additional chapters (Scatter Search, Chap. 5; GRASP: Greedy Randomized Adaptive Search Procedures, Chap. 11; and Very Large-Scale Neighborhood Search, Chap. 13). These new chapters, along with the revised chapters, we believe, provide significant insight to the most popular search methodologies that are in use today.

There are many people that we need to thank. Without their help and support, this book would not have been possible. We are grateful to Jacek Blazewicz for writing such a generous and positive foreword for this second edition. We are deeply indebted to all the authors for their contributions and for their patience about the time that it took to get this edition into press. The authors represent a distinguished group of scientists who have all prepared, and updated, excellent contributions in a conscientious and professional way. We are also grateful to our excellent copy editor, Piers Maddox. We recognize that we did not always provide him with the material in a form that he would have preferred. However, he dealt with everything very quickly and extremely dilligently. We would also like to extend our thanks to the staff at Springer, particularly Matthew Amboy, who have supported the preparation of this book from the very beginning.

We hope you enjoy reading this book and gain as much from it as we gained in editing it.

Stirling, UK — Edmund K. Burke
Nottingham, UK — Graham Kendall

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