

## **Call for Submissions to an Edited book on “Case Studies of Realistic Applications of Optimum Decision making”**

I (Katta G. Murty ) am editing for Springer, a book with the above tentative title, that instructors in modeling courses in OR curricula can use as a text book. Each chapter in this book will be a case study on some challenging real world application of OR techniques, with all the data provided in a companion website that Springer will set up and maintain for this book. Currently there is no book of sufficient depth in this area.

Most OR curricula contain a course “Modeling” (some departments give it fancy names like “Modeling Studio”). There are a few small books containing text-book type modeling examples, which are used for these courses. All the instructors teaching these courses would like to give project exercises that the students have to model, solve, and write an implementation report on by the end of the term; and instructors of these courses always have to struggle to find suitable project problems to assign.

Business schools have developed a rich collection of cases for teaching MBA courses, which are sold by many organizations. Some sell cases individually for prices in the range of 3 - 5\$/case. Many of these cases sold this way only contain the statement of the problem, but do not discuss the best solution strategy, so the students cannot use them for self-study.

Surprisingly, so far OR Departments have not yet developed corresponding collections of cases suitable for quantitatively -oriented OR curricula; and there is a pressing need for good realistic OR cases. The aim of this book is to fill that need. We believe most OR graduates will buy this book for their shelves, because it provide invaluable guidance to fresh OR graduates to tackle problems that they are likely to face when they join the job market. For the same reason, we believe many professionals will buy this book for their shelves.

Also, the existing “small OR modeling books” mentioned above only contain cases for which the obvious solution method is one like linear programming or integer programming with theoretically well established convergence criteria discussed in OR text books. None of

them contain a case for which the most appropriate solution method in practice is a heuristic method like a greedy method with appropriately set up “greediness criterion” that is not theoretically guaranteed to give the best solution. In the book, all methods including heuristic ones will be covered.

Also, in almost all OR courses (not necessarily “modeling courses”, but those like LP, IP, etc.); it has become an established practice for instructors to assign project assignments illustrating the application of the theories covered in the course. The aim of the book is to provide appropriate project problems for these instructors also.

Another thing to consider is the following. The OR professional society INFORMS, has developed the competition “Edelman Award competition for OR Practice” which has now become very popular, attracting a lot of participants from all over the world. Surprisingly, so far there is no major text-book discussing OR practice problems, this book will fill that gap.

We would like to limit each chapter to about 20 pages, but this limit is flexible. Our hope is to complete the work on this book by the end of 2012. Submissions received after that can be included in a companion web-extension under the heading “Additional Case Studies” made available on the web.

### **Style for preparing submissions for Chapters in the Book**

The tentative title of the book is “Case Studies of Realistic Applications of Optimum Decision Making”. OR textbooks, with their goal of teaching theory and methodology, are typically written in “theorem-proof” style. That style is not really appropriate for this book, because its goals are:

- to serve as one from which students can learn intelligent modeling for real-world optimal decision making problems,
- to teach students how to choose an algorithm (either one that has been theoretically proven to converge; or a heuristic verified to yield good solutions, and is far easier to implement in the real-world setting where the problem will be solved) for attacking them,

- and to expose the student to a variety of applications in a wide variety of areas,
- and teach them how to take advantage of any special structure in the problem to simplify the model and the algorithm used to solve it.

So, a primary aim of this book is to serve as a textbook in mathematical modeling courses in OR curricula, with a collection of application problems with associated data that will be made available at a companion website, that can be used as project assignments. Each Chapter in this book should describe a problem in some application area that requires optimization and OR methodology to solve, and is representative of problems that practitioners face in their daily work, and must provide all the relevant information and data needed for solving the problem. Each submission for a Chapter in this book should describe an application problem including the following:

- a clear description of the real-world setting where it is commonly faced
- the goals to be achieved
- description of all the data provided
- and any special features in it that may prove advantageous in solving it,
- description of the approaches used to model and solve the problem, and the resulting mathematical models,
- the algorithms used and why they were chosen, and software used,
- implementation details of each approach, and how it will be used in real-world settings,
- highlights of the solution obtained by each approach, and analysis comparing them,

- and discussion of which approach may be most suitable in real-world settings.

If **data confidentiality** is an issue, the cases can be prepared with simulated realistic data instead. Also, any detail that is considered sensitive or confidential can be omitted in preparing the case.

For an example of an article that we are looking for, please go to the website <http://www-personal.umich.edu/~murty/> and look for the article on “Locomotive fueling problem”, which is the 2nd from the bottom under “Selected Publications” there. This is a sample chapter in this book, on a problem set up by the RAS (Railroad Applications Society of INFORMS) recently as a contest problem. It is typical of the problems that railroad engineers face in their daily work. All the hundreds of pages of data for this problem and its descriptions can be seen at <http://www.informs.org/Community/RAS/Problem-Solving-Competition/2010-RAS-Competition>

We are hoping to attract about 40 to 50 cases to make the book into a rich collection of challenging cases from a variety of application areas, and reporting a wide variety of approaches used. Final copies of the chapters must be submitted in camera-ready form, using Springer style-guides that will be provided.

### **What to Submit**

For each case we need two files. The 1st describes the problem setting clearly, then a clear statement of the problem, what is required to be achieved, decisions to be made, and provides all the data for the problem explaining it clearly. This file will be set up by Springer on the book’s website, to which all readers will be given access. This is what faculty will use if they want to assign the problem as a project problem in a modeling course.

The 2nd file gives the description of the problem setting, the problem, and description of what data is provided and the website where the data can be accessed. And then it describes ways in which the problem can be modeled and solved. If two or more approaches are used to

model and solve the problem, it compares the solutions obtained from them, and recommends the best one for real world implementation based on various considerations like ease of implementation, quality of solutions obtained etc.

An example chapter (in first draft form) is the one on “Locomotive fueling problem”, 2nd from the bottom under “Selected Publications” on my webpage at: <http://www-personal.umich.edu/~murty/> The website containing all the 1st file and all the data for this problem is given above.

We will continue accepting cases even after the deadline, but once the page limit for the book is reached, submitted cases will be set up on the book’s website.

If you would like to submit a case please contact me, as soon as possible; and I will provide the templates to use (Word or Latex) to prepare it.

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