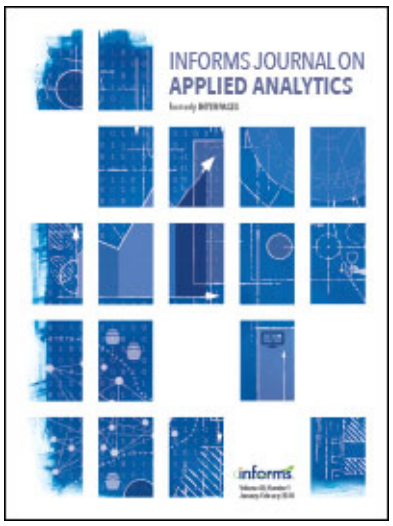

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Book Reviews

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Book Reviews

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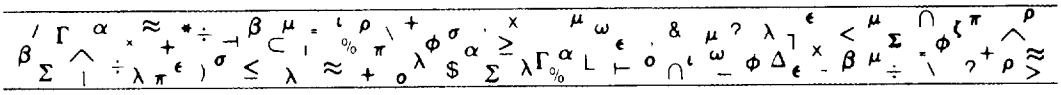

The range of books reviewed is wide, covering theory and applications in operations research, statistics, econometrics, mathematics, computers, and information systems (no software is reviewed). In addition, we include books in other fields that emphasize technical applications. Publishers who wish to have their books and proceedings reviewed should send them to Professor Benjamin Lev, School of Management, The University of Michigan-Dearborn, 4901 Evergreen Road, Dearborn, Michigan 48128-1491. We list the books and proceedings received; not all books received can be reviewed because space and time are limited. Those who would like to review books are urged to send me their names, addresses, and specific areas of expertise. We commission all reviews and do not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send me copies of such books.

KACPRZYK, JANUSZ AND FEDRIZZI, MARIO, eds. 1990, *Multiperson Decision Models Using Fuzzy Sets and Possibility Theory*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 346 pp., $119.00.

This book is a collection of 27 articles that introduce basic concepts of multiperson decision models and demonstrate the application of fuzzy set theory and possibility theory to those models. Because enough care has been taken to include introductory materials, the book is suitable for theoreticians and practitioners who wish to get acquainted with the subject quickly. Having said that I should immediately add that the book presumes good proficiency in set theory and logic.

The articles are arranged in five sections, namely, "Introduction," "General issues," "Group decision making," "Team decision making," and "Fuzzy games." One may read the introductory section and then branch out to any of the other sections as one pleases. Within each section, the arti-

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cles are reasonably coherent, and they span a variety of topics ranging from basic concepts to sophisticated models.

Those who are starting from scratch would find the three articles in the introductory section quite useful. The first article is by Fishburn, an authority on multiperson decision theory. He gives a historical perspective on the development of methods of election and social choice. The article is not only a good introduction but also a compact literature survey on the topic. In the next article, Novak introduces the fundamental concepts of fuzzy set theory and possibility theory. In the third article, Nurmi and the two editors introduce the application of fuzzy preferences to voting theory.

The second section considers general issues in the application of fuzzy set theory to decision making. Among the nine articles in this section, the ones that appealed to me are "Aggregation of possibility measures" by Dubois and Prade, "Modeling valued preference relations" by Ovchinnikov, "Revealed fuzzy preferences" by Bondareva, and "An approach to customized end-user views in multi-user information retrieval systems" by Larsen and Yager.

The third section concerns applications to group decision making and it also contains nine articles. Notable among them are "Means and social welfare functions in fuzzy binary relation spaces" by Ovchinnikov, "Aggregation of fuzzy preferences" by Barrett and Pattanaik, "On group decision making under fuzzy preferences" by Tanino, and "On a consensus measure in a group MCDM problem" by Fedrizzi.

The fourth section is a short one comprising two articles on fuzzy team decision making. Since team theory is less well known, I shall say a few words about it. Team decision making differs from group decision making in that there are asymmetries among team members. Usually these asymmetries are in the information available to the members, but they could also be in the members' skills, choices, and so forth. Needless to say, there is much scope for further research in this area. The book contains an article by Nojiri who applies team decision theory to distributed problem solving. The article can easily motivate readers to extend this line of research in many different directions.

The final section on fuzzy games presents four articles that deal with fuzziness in payoffs and preferences in noncooperative as well as cooperative games. Orlovski's article on two-person games and Billot's on exchange economy are worthy of mention.

In summary, the book can help an interested reader to get started in fuzzy decision theory and to specialize in one or more of several different directions.

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CHISMAN, JAMES 1992, *Introduction to Simulation Modeling Using GPSS/PC*, Prentice-Hall, Englewood Cliffs, New Jersey, 241 pp., (paper), $22.50.

Digital (Monte Carlo) simulation has become one of the most important techniques in many fields of engineering, but options for teaching this subject to engineering students have been limited. Typi-

cally, the instructor has had to choose either a good treatment of the concepts and theory of simulation, with little or no direct connection to simulation software, or a text specifically linked to a software package but without much discussion of whether the models make sense. In the latter category, one may have to choose between a text with a good general discussion but little detail on how to use the software and a text that treats the software package in so much detail that the general concepts are hard to follow.

A classic example of a good general treatment without discussion of specific software languages is Law and Kelton [1990]; it is an excellent reference book but requires considerable additional effort by the instructor to give students hands-on experience. Schriber [1991], Pritsker [1986] and Pegden, Shannon and Sadowski [1990] have written solid texts featuring detailed explanation of how to use one language: GPSS/H, SLAM, and SIMAN, respectively. In fact, the latter two books double as the primary user documentation for their languages. Banks and Carson [1984] provide a very good treatment of general concepts while introducing a language, GPSS/H, but not explaining its operation and use in detail. Hoover and Perry [1989] make an excellent compromise, presenting the general concepts along with primers on three languages—GPSS/H, SIMAN, and SIMSCRIPT—and problems and applications that the instructor can tailor to whichever language(s) he or she selects. Hoover and Perry's book does not come bundled with any of the three languages. Those who adopt the text can obtain diskette copies of source code for worked problems from the authors. Calculus is required for the sections on congestion and inventory models.

Chisman's book is another excellent compromise, especially for industrial engineering and operations management students. He first presents a brief but solid overview of the relevant statistical and analytical concepts, then introduces GPSS/PC in cookbook fashion. This approach is intended to get students started early in formulating and solving problems in the language. He then takes the student through other functions and capabilities of the language, gradually increasing complexity and always keying the lessons to solving realistic problems. Finally, he presents a good discussion of the broad applicability of simulation to a variety of types of problems, again using numerous modeling exercises to help the student learn by doing; this chapter contains detailed discussion of a number of worked examples, with results provided in an appendix. These examples provide a good tutorial in the language and in the problem-solving approach.

Unlike most of the other texts mentioned above, this book requires neither calculus nor mathematical statistics nor programming experience as prerequisites. Its emphasis on sensible principles of evaluation and design, leaving out the more technical aspects of these topics, makes it especially appropriate for a one-semester applications-oriented survey course.

The book comes bundled with the student version of GPSS/PC (Minuteman Software, Stow, Massachusetts), a refinement of GPSSV. GPSSV was one of the first successful simulation languages; it was

developed by IBM, which no longer supports it. GPSS/PC is substantially different from GPSS/H (Wolverine software, Annandale, Virginia), another refinement of GPSSV. The book contains an appendix describing the major differences between GPSS/PC and GPSSV, noting that GPSS/H was designed to run GPSSV programs with little or no modification. (No such claim is offered regarding GPSS/PC.) I was convinced after very limited testing that GPSS/H and GPSS/PC differ nontrivially from each other but cannot provide a confident assessment of the degree of difficulty one would encounter in adapting programs from one to the other.

The book is very well written. It is particularly strong in guiding the student through the use and modification of the GPSS/PC language and in providing much sensible advice on how to evaluate models and their output The diskettes bundled with the book include a number of sample problems keyed to the book, as well as the executable modules. The software has a very good user interface and seems unusually easy to get started with.

This text should serve well, therefore, for instructors who are seeking a good compromise between teaching a simulation language and teaching general simulation principles and concepts in a one-semester, applications-oriented course. It is a welcome addition to the set of textbooks available for this important and exciting subject.

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ANCKER, C. J., JR. AND GAFARIAN, A. V. 1992, *Modern Combat Models: A Critique of Their Foundations*, Operations Research Society of America, Baltimore, Maryland, 192 pp., $17.00.

This book is a major contribution to the ongoing discussion of how to model combat. Its conclusions imply that combat models based on deterministic attrition models will only accidentally approximate the mean values of the random processes and the variances in the random processes (lacking in the deterministic models) invite erroneous decisions based on the results.

F. W. Lanchester's insight that combat power can be quantified and that the relationships between opposing powers need not be linear functions of the numbers is the root of modern combat models. Lanchester described random physical processes and approximated them with differential equation models. Modern (deterministic) combat models have greatly elaborated Lanchester's differential models of combat, often including dozens of factors

in the attrition equations. However, the number of combatants is not a continuous variable as assumed by the differential models. Further, even if combat results could be exactly determined by physical and psychological conditions, no existing model is ambitious enough to attempt that level of detail. The deterministic Lanchester attrition must be regarded as an approximation. If one abandons hope for absolute determinism, then combat activities must be modeled as random processes with distributions of results. In this case, the mathematical model that most closely approximates combat and for which there are useful mathematically derived corollaries is a terminating generalized renewal model. Simpler models (because they are generalized renewal models restricted by further assumptions), the stochastic Lanchester models, admit more complete analyses. The differential Lanchester models are simpler yet and enormously more tractable.

In this book, Ancker and Gafarian show that the critical connection between the differential Lanchester models and the stochastic Lanchester models (and later the generalized renewal models) is faulty. To be useful, the predictions of a model must be related to reality. When a simpler model is used in place of a more complex model for convenience, its predictions must be related to the more complex model. Ancker and Gafarian show that the logical (engineering oriented) derivations for the parameters of the differential Lanchester models produce results that are at variance (often significant) with the corresponding results of the stochastic Lanchester (and generalized renewal) models. Thus, while there may be some differential Lanchester model that produces useful approximations of combat results, no methodology for connecting its parameter values to engineering-oriented data has been advanced. As should be expected, the variances appear most acute precisely where combat modeling is most needed, in battles near parity.

This book presupposes an understanding of Lanchester attrition theory [Taylor 1983]. It is closely reasoned and uses mathematics as its basic language; however, the thesis is argued in the first 45 pages and may be comprehended without full understanding of the mathematics. (The remainder of the text is a compilation of particular results from the literature.) I recommend it for any student of military operations research or combat modeling. I particularly recommend it to any user or builder of combat models.

Reference

Taylor, J. G. 1983, *Lanchester Models of Warfare*, Volumes 1 and 2, Operations Research Society of America, Baltimore, Maryland.

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YOUNG, H. PEYTON, ed. 1992, *Negotiation Analysis*, The University of Michigan Press, Ann Arbor, Michigan, 216 pp., $44.50 cloth, $15.95 paper.

The editor of this fine collection of essays presents it to the reader as a companion volume to Howard Raiffa's seminal *The Art and Science of Negotiation* [1982]. The justification is that much work in this field is reported at a technical level in an eclectic range of journals and is therefore inac-

cessible to the nonexpert. This certainly resonates with my own teaching experience; it is difficult striking a balance between the analytical (too difficult for the time available) and the normative (too facile).

The idea behind the book, then, is meritorious. Although, the book reflects considerable editorial skill, the degree to which it succeeds is more difficult to evaluate. The collection begins with a carefully crafted introduction by the editor in which he sketches the ideas that follow. Peyton Young also provides the first piece, a review of the idea of fairness from a game-theoretic perspective. Steven Brahms, Marc Kilgour, and Samuel Merrill III give a succinct outline of arbitration procedures, and Roger Myerson provides an interesting analysis of mediation in an idealized commercial bargaining process. Negotiation as conflict is explored by O'Neill, who concentrates on the ideas of threats and escalation.

The essay by Max Bazerman and Margaret Neale stands out and itself highlights the fundamental problem with the collection. Their contribution focuses on the difficulties of reconciling the analytical prescriptions of game theory with the results of descriptive research. Bazerman and Neale argue that the assumptions required by game theory limit its effectiveness but that the descriptive work has generally been a poor basis for suggesting good practice. The authors argue that this dichotomy needs resolution and that between the unrealistic and the pointless there is scope for developing an applicable theory. Because observed deviations from rationality are systematic (and not random), it is possible to develop a laundry list of common failings; a negotiator can then be wary of these temptations and look out for the opponent falling into the same traps.

The collection is rounded off by contributions from Ralph Keeney and Howard Raiffa, who consider ways of structuring trade-offs in multiple issue negotiations, and from David Lax and James Sebenius, who concentrate on the process of coalition formation.

The book as a whole illustrates the problem described by Bazerman and Neale. Although each piece is well written, scholarly, and authoritative, my overall impression is that the field is indeed fragmented and that its awkward relationship to practice is symptomatic of some fundamental problem. A final chapter that presented a coherent synthesis of the ideas would have been useful, but maybe such a chapter could not yet be written. I hope this book will stimulate further investigation of the ideas so eloquently expressed here.

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Books Received for Review

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Bhat, U. Narayan and Basawa, Ishwar V , eds 1992, *Queueing and Related Models*, Oxford Science, Cary, North Carolina, 348 pp , $89 00