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Abstract

A recently-published work in by two well-known authors in the field of spreadsheet modeling is reviewed.

Keywords

mathematical modeling, the active modeler

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Book Review:
The Active Modeler: Mathematical Modeling with
Microsoft[®] Excel
by E. Neuwirth and D. Arganbright
(Brooks/Cole, Belmont (CA), 2004, ISBN 0-534-42085-0)

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Abstract

A recently-published work in by two well-known authors in the field of spreadsheet modeling is reviewed.

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This is an excellent and innovative textbook, which works at several levels. As a textbook on mathematical modelling it covers a wide range of topics, including Fibonacci numbers, growth models, epidemics and population dynamics, simple projectile motion, heat propagation, greatest common divisor, the sieve of Eratosthenes, graphing, Newton and secant methods, fitting a curve to data, creative mathematics in everyday settings (eg a bicycle investigation, ski racing), combinatorics and probability, optimal bridge location, medicine dosage, game theory and other topics. The modelling is developed without calculus. This is unusual in traditional curricula, but follows the “new calculus” movement in North America (for example, see the Introduction to Stewart’s Calculus text [11]). Nevertheless, this book would be suitable for use in any modelling course, even one that is based in calculus.

The first two chapters introduce discrete models and difference equations. After these chapters, the topics can be covered in any order, giving great flexibility to the lecturer. The explanations are sufficiently clear that the book could be used for self-study or in a flexible learning environment.

A particular innovation in this book is the use of Microsoft[®] Excel. The text implements the use of a spreadsheet software package, with the assumption that Excel is

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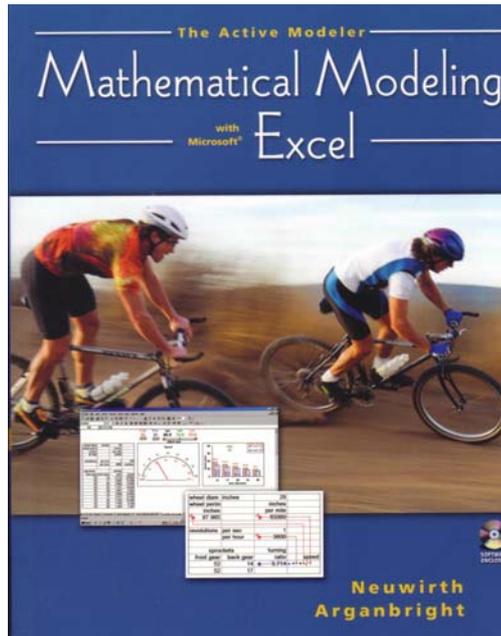


Figure 1: The front cover of the book.

	A	B
1	period	rabbit pairs
2	1	1
3	=A2+1	1

Figure 2: Most books instruct the reader to type formulas into the spreadsheet cells.

already mainstream technology. Most other mathematical modelling texts either are not integrated with a software package, or assume the use of symbolic software. Science education research has shown that the use of specialist mathematical software creates an additional barrier to learning: not only do students have to learn the mathematical knowledge content, but they also have to learn a new “programming language” in order to do so [7]. Conversely, since students would be (at least slightly) more familiar with the use of spreadsheets, there is less of a learning barrier: Ehrmann noted many years ago “software that isn’t designed for instruction can be good for learning” [6]. The use of spreadsheets in an educational setting will also enhance the students’ generic skills and overall employability [2], [3], [10], [12].

Although the book assumes that spreadsheets are mainstream technology, pre-existing knowledge of spreadsheets [9] is not assumed. Instead students are introduced to spread-

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period	rabbit pairs
● 1	1
▼ + 1	1

Figure 3: Innovative diagrams illustrate how spreadsheet formulas are constructed by “pointing and clicking” at the locations indicated by the black dots”.

sheets in the first two chapters and each topic or module introduces a new feature of *Excel*. Where other spreadsheet books instruct the reader to type formulas into the spreadsheet cells, the authors have successfully translated the “point and click” feature of modern software into a paper-based graphical equivalent. In Figure 3, the arrow shows where a cell reference must be inserted into the formula in cell A3 of Figure 2 by pointing at the location of the black dot and clicking.

More complicated formulas are constructed by pointing the mouse at the cells indicated by the dots and clicking to place those cell references into the formula at the positions indicated by the arrows: see Figure 4. In these diagrams, the arrows with dots indicate relative cell references. Thus in Figure 3, the arrow indicates the formula is one cell below the cell being referenced. Other symbols are used to indicate absolute references where the column or the row or both is “fixed” when the formula is copied to another cell: see Figure 5. This reviewer is unaware of *any* other spreadsheet textbook which has a pictorial representation of formulas.

Learners have different learning styles [4], [5], [8]. Other spreadsheet textbooks unintentionally advantage learners who favour the mathematical/symbolic “intelligence” [8], while indirectly discriminating against other learners. The pictorial representation, introduced in this book, makes spreadsheets more accessible to a larger group of learners and will become the standard against which future books and journal articles on the use of spreadsheets will be compared.

This representation is one of those innovations [1], that, in hindsight, seems obvious, but for some reason, no one had realised earlier.

The book is filled with interesting and unusual exercises. A picture on the cover of the book (see Figure 1 and Figure 6) shows that *Excel* can be used to simulate an analog speedometer. This is another great idea [1]. Yet here it is, as an implied extension to student exercises in Chapters 5 and 6. Discussion of *Excel* features in later topics is independent of knowledge of the earlier topics and chapters. The index is quite comprehensive and allows readers, who are already familiar with *Excel*, to use this book as a reference.

A CD ROM accompanies the book. A series of Flash videos demonstrate basic spreadsheet skills. The CD ROM also has the spreadsheet models discussed as examples in the text, presented as a “basic” version (the same version as the text) and an “enhanced” version with a better user interface. The CD is PC (Windows 98 or better)

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period	rabbit pairs
1	1
2	1
3	2
4	
5	

Figure 4: More involved formulas are constructed by “pointing and clicking” at the locations indicated by the black dots.

Rate	Star	Interes
0.03	1000	*
	250.34	
	3000	
	2341.97	

Figure 5: Both relative and absolute references in formulas are represented pictorially.

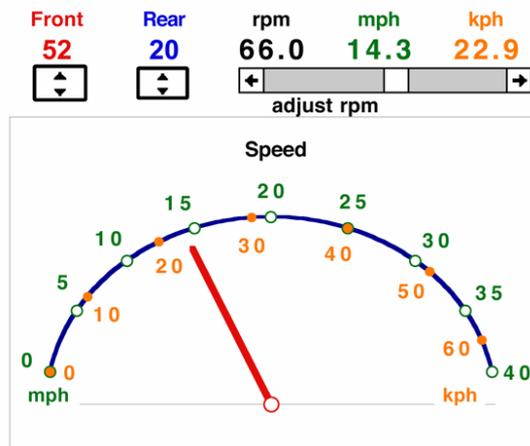


Figure 6: A picture on the cover of the book shows that Excel can be used to simulate an analog speedometer

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and Mac (OS X) compatible.

In summary, this is an outstanding book. It can serve both as a student text and as a reference. It can be used as a self-study source or as the text accompanying a course on mathematical modelling. The explanations of how to use *Excel* are clear and supported by innovative diagrams in the book and Flash videos on the CD ROM.

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