Review

**An introduction to agent-based modeling : modeling natural, social, and engineered complex systems with NetLogo**

Wilensky U., Rand W., The MIT Press, Cambridge, MA, 2015. 504 pp. Type: Book (978-0-262731-89-8)

Date Reviewed: Jun 30 2015 Also Reviewed by Full Text



Readers who are already familiar with agent-based modeling are probably already aware of this book and would certainly recognize the name of the first author. So, I will address the beginning of this review to those who are not. Complex systems, such as the economy, can be conceptualized in two very different ways. One view would assert that the economy is governed by invisible mathematical laws, much the way that, say, planetary motion is governed by the laws of gravity. This view, which we can think of as the top-down view, would model the economy using system-level mathematical functions, usually differential equations. If you want to know what will happen if interest rates rise, just plug it into the equations and see how employment or growth is affected. An alternative view would see the economy as emergent properties that arise from the interactions of the people who make up the economy. These people (referred to as agents in this view) may be consumers, producers, decision makers, or anyone whose behavior affects and is affected by the other agents. Through their behaviors and interactions, they produce emergent properties that we refer to as the economy. This view can be thought of as the bottom-up view.

Since the days of Isaac Newton, scientists have largely adopted the top-down view to describe physical and social phenomena. Although the task of gathering data and developing differential equations to describe the data is no small chore, it pales in comparison to the task of modeling the behaviors, interactions, and resulting emergent properties of thousands, perhaps millions, of agents producing these emergent phenomena. But lately, the bottom-up view has been gaining more traction. Why is this? There are two primary reasons: the frequency with which we encounter complex systems, and the availability of software used to construct and execute models of these complex systems.

This bottom-up modeling approach is known as agent-based modeling. The software used to implement the models in the text is known as NetLogo. The first author of the book is also the author of the software. For trivia buffs or those interested in the history of computers, here is an interesting tidbit. Two years before E. F. Codd published his groundbreaking paper on the relational data model, he published a book on cellular automata that is a precursor to agent-based modeling.

This book begins with some fundamentals of complex systems and then leads the reader into some concrete examples implemented in NetLogo. The initial models are fairly simple, such as a model showing the spread of forest fires as a function of tree density. The NetLogo code used to create the model is very straightforward as well. As the book progresses, the models get increasingly more complicated and robust as the NetLogo code gets more sophisticated. Although the text and code are intertwined, the book is written in such a way that the reader can read through it and work out the examples along the way, or just read it and skip over the code. By the end of the book, the reader should be able to construct and explore his or her own agent-based model.

This book is extremely well written, very readable, beautifully illustrated, and eminently accessible with alternating clear explanations and clearly explained code examples. As one delves more deeply into the book, he or she also delves more deeply into agent-based modeling using the NetLogo software. It would be an excellent choice as a textbook for a course in agent-based modeling. If you do not have such a course, this book is so good that you might want to consider creating one. Outside of the classroom, if

you are just interested in learning more about this fascinating emerging modeling technique, this book would be an excellent choice to bring you up to speed. This is one of the better books I have seen in a while on any technical topic. And if readers of this review are remotely interested in this topic, I would strongly encourage them to get a copy of this book.

More reviews about this item: Amazon

Reviewer: J. M. Artz Review #: CR143564 (1510-0870)



Other reviews under "**Multiagent Systems**":

| | Date |
|---|---|
| From pattern formation to material computation: multi-agent modelling of *Physarum polycephalum*<br>Jones J., Springer Publishing Company, Incorporated, New York, NY, 2015. 370 pp. Type: Book (978-3-319168-22-7) | Nov 5 2015 |
| Industrial agents: emerging applications of software agents in industry<br>Leitão P. (ed), Karnouskos S. (ed), Elsevier Science Publishers B. V., Amsterdam, the Netherlands, 2015. 476 pp. Type: Book (978-0-128003-41-1) | Oct 27 2015 |
| Voter dissatisfaction in committee elections<br>Baumeister D., Dennisen S. AAMAS 2015 (Proceedings of the 2015 International Conference on Autonomous Agents and Multiagent Systems, Istanbul, Turkey, May 4-8, 2015) 1707-1708, 2015. Type: Proceedings | Jun 30 2015 |

more...