

The Computer as Mystic

Reviewing *Digital Mantras: The Languages of Abstract and Virtual Worlds* by Steven R. Holtzman (MIT Press, 1994, ISBN 0-262-08228-4, 324 pp., hardcover \$29.95)

This is an unusual book, coming from an unusual mind. The Library of Congress categories on the flyleaf are computers and virtual reality, but philosophy, art history, and music theory would be equally appropriate. It is exactly the sort of book you would expect from a man who studied philosophy, earned a PhD in computer science, and produced a number of computer-generated musical compositions (available on a companion CD, not used in this review). In this book, Steven Holtzman shows how the discovery of generative grammars for human language, music, and art reveal the potential for computers to become creative—and more.

The book is organized into three major sections: Structures, Structure Manipulators, and Vibration. The Structures section will probably be the most instructive, since it covers topics that the average college education doesn't. The chapters explore the concentric levels of abstraction of human expression, beginning with grammar and moving through the structures of music theory and the visual arts. The seemingly disparate threads of these chapters are pulled together into a cogent whole in Chapter 8. Languages, whether verbal, musical, or visual, are formal systems that can be expressed and generated abstractly, and in Holtzman's words, "Computers are the ultimate manipulators of abstract structures."

The next section, Structure Manipulators, shows how computers have used abstract structures to create verbal, musical, and visual expression. It surveys the development of computers, focusing first on Terry Winograd's "natural language," Karlheinz Stockhausen's and Gottfried Michael Koenig's early experiments with electronic music, and Iannis Xenakis's stochastic music. It devotes a chapter to experiments in machine-produced art, from line drawings based on Kandinsky's rules to Harold Cohen's work with the Aaron drawing program that established "a grammar for drawing," to virtual reality and cyberspace. The section culminates in the discussion of the human role as meta-artist, where peo-

ple provide the computer with software and set it going. That brings up an intriguing question: If the human is the meta-artist, does that make the computer an artist? Can a machine be creative?

Holtzman answers the above question in the affirmative in the Vibration section. Although we tend to think of human emotions as somehow special, he proposes that since all brain activity can ultimately be reduced to electrical impulses, there is no reason why the electrical impulses produced in a complex piece of hardware cannot produce emotion. The feelings of a machine might differ from those of a human, but that does not invalidate them.

It's evident from the title, *Digital Mantras*, that the thread that ties the book together will include Eastern philosophies. Excerpts from Holtzman's diary, kept during a pilgrimage through Tibet, appear between sections. The excerpts serve to set a mood of contemplation, a context for the more objective (though often just as philosophical) material in the chapters.

As you can tell from this review, this book challenges its reader. But it is a superbly manipulative read. At first, it's not clear where the author is leading. As the arguments begin to come together, like the sudden emergence of a braided Maypole from ribbons and dancing children, the book becomes a united whole, one logical argument leading toward the conclusion above. It is not a book that everyone will appreciate, but if you do read it, you may not look at the world—or your computer—the same way again. **MM**

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