

Book Review

William R. Sherman and Alan B. Craig. *Understanding Virtual Reality, Interface, Application, and Design*. San Francisco: Elsevier Science, 2003. XXIV + 582 pp.

Introduction

Understanding Virtual Reality, Interface, Application, and Design, sets out to provide an extensive foundation of knowledge concerning the medium of virtual reality as a means for communicating and sharing information. To support this mission, *Understanding Virtual Reality*, presents an in-depth exploration of virtual reality. As its title suggests, it clearly covers the topics of interface, application, and design. It begins by clearly defining virtual reality, the medium, including key elements, terminology and position in history as a communication medium. Next, it covers virtual reality systems and the technical aspects in terms of the input and output interfaces. It details user input and the necessary devices for information capture, then digs much deeper into interface output as well as rendering and design aspects of the three primary forms of sensory output: visual (how we see VR), aural (how we hear VR), and haptic (how we feel VR). Beyond the primary senses, the book goes on to examine the many ways we interact with VR through metaphors and methods including: manipulation, navigation, and communication. Throughout the book the authors supply descriptive case studies, excellent visuals, informative/comparative charts, 32 color plates, and a myriad of illustrations to describe the technology and techniques. While this book was published in 2003, and the authors admit the advances in VR technology are too rapid to be covered in a printed volume, it is still a relevant textbook choice because of its timeless approach.

Understanding Virtual Reality, is written for undergraduate and graduate courses alike, as well as anyone interested in a broad-strokes review of VR. Because of the breadth of the volume, the authors suggest a tailored approach to the content depending on one's specific focus. (p. XX)

Understanding Virtual Reality presents at its core, a solid foundation of base information about Virtual Reality. **It is the authors' intention is to provide an overview of VR, but also a timeless resource on how to provide greater understanding, increased productivity, and further interest in virtual reality.** As example, the book contains numerous examples of VR being used across vastly divergent fields, but most importantly it helps us understand why and how we might apply VR to real world problems. It is this understanding of its application potential that projects, for the reader, the future of virtual reality.

In order to set the stage for a greater understanding of virtual reality as a communication medium, we are offered an historic overview of the communication mediums from which it evolved. Sherman and Craig provide 66 technology milestones to help us "...understand the forces that have come to bear on the field of VR and drive it forward." (p. 24) To name a few: 1916, Albert B. Pratt invents a head-based periscope display; 1956, Sensorama multimodal experience display allow for sensory replay including sights, sounds, smells, and environmental sensations; 1977, the Sayre Glove estimates the configuration of a users hand; 1989, VPL Research, Inc. offers affordable hardware on a commercial basis, thus lowering the threshold for researchers to develop their own VR; 1992, the CAVE, an immersive virtual environment for multiple participants was introduced at SIGGRAPH conference; 1999, ARToolkit, an open source, tracking library designed for augmented reality is introduced (pp. 24-36). This expansive timeline also identifies whether the specific technologies were technology driven, market driven,

a conceptual advance, or occurred due to market forces. Seeing the evolutionary roots of VR helps us to better understand its role as a communication medium.

To understand how productivity can be increased by virtual reality, the authors provide a multitude of examples that focus on the characteristics of VR across a variety of fields. First, Sherman and Craig emphasize the unique features of the medium, such as the ability to manipulate time and space, the interactivity of multiple and simultaneous participants, and the potential for participants to drive the narrative flow of experience (p. 52). These controls along with their corresponding language elements: menus, avatars, pointers, and graphical representations introduce the possibilities that are addressed later in the book in more technical detail. An understanding of the elements and language of VR help us define productivity in a variety of seemingly opposite contexts. For example Margaret Geller in her serious, scientific study of the placement of galaxies using a VR program at Harvard University (NSCA) as opposed to Danielle and Cindy, two children exploring play and narrative in the fantasy world of Crayonland, developed by Dave Pape at the University of Illinois. (p. 60, figure 2-11). Both productive uses of virtual reality, but in vastly different ways.

More examples of VR's ability to increase productivity are demonstrated in the four in-depth application case studies found in the appendices A-D. In each case study, Sherman and Craig present why the application was needed, what had been done previously, how the VR was incorporated, and what was accomplished by it. The case studies provide real-world application and evidence of the successfully implemented design principles that are technically detailed in

Part II- Systems, chapters 3-5, aptly named: *Interface to the Virtual World–Input*, *Interface to the Virtual World–Output*, and *Rendering the Virtual World*.

One case study (appendix C) details how Boeing Virtual Systems Research and Technology Group is using augmented reality to aid the assembly of wiring bundles in aircraft manufacturing. Beginning in August, 1994-1997, Boeing, CMU, Honeywell, and Virtual Vision, Inc. collaborated on a project titled “Wearable Computer Systems with Transparent, Head-Mounted Displays.” (funded by DARPA TRP) The AR system provides the user with a schematic overlay of the necessary paperwork/instructions for wiring assembly, thus eliminating the need to look away from the work. While there are many potential benefits, such as improved quality, decreased worker fatigue, and lower peripheral costs, the project’s primary expectation was improvement in productivity. Their expectations were achieved in the early phases of experimentation. The pilot project did not include audio output or voice input, which have both since been implemented in secondary phases of the original case study. In addition to productivity improvements in manufacturing, David Mizell, manager of Boeing VSG states “there are applications all over the factory, for example maintenance, (and) training...in both military and civilian aircraft production.” It is easy to imagine the implications this research could have in a wide variety of fields. All of the case studies provided by Sherman and Craig act as a jumping board for imagining what might be next.

To address the timeless quality of the text we look to chapters eight and nine. Sherman and Craig bring together the all the components of the first seven chapters into chapter eight: *Experience Design: Applying VR to a Problem*. Here, they help the reader understand what

questions to ask when considering the appropriateness of VR for a given task. They state “it is generally not wise to approach VR looking for a problem to solve. You should have a problem and look to virtual reality as a possible solution.” In chapter nine: *The Future of Virtual Reality*, Sherman and Craig provide a thought-provoking and well-written projection of virtual reality—the medium by outlining typical stages of technology development (figure 9-1, p. 438) and exploring other models of how technology evolves. They additionally offer insight into hardware and software trends and futures. The projections come from trusted and respected sources as the authors’ combined experience in the field of virtual reality has seen them through innumerable roles across the globe in leadership, authorship, research, development, and award-winning product designs.

Understanding Virtual Reality definitely fulfills its mission of expanding our knowledge and generating increased interest in the field of VR. My only frustration with the book was the authors’ mention of supplemental online material, including a scholarly-adherent modern glossary of VR terminology, which after an extended online search, I still cannot find. Despite that, I am quite satisfied with my choice of this book for a graduate-level introduction to the world of virtual reality. A reader can use this book to learn how to create compelling virtual reality applications, but the true value of this book lies in its spotlight on the timeless and unique features of virtual reality. It gives the reader a comprehensive understanding of the medium by revealing its roots and mapping its future with a substantial amount of technical knowledge in between. Furthermore, it sparks our imagination of the role of virtual reality as a significant and contributing medium in the evolution of science, art, medicine, education, manufacturing, and communication.