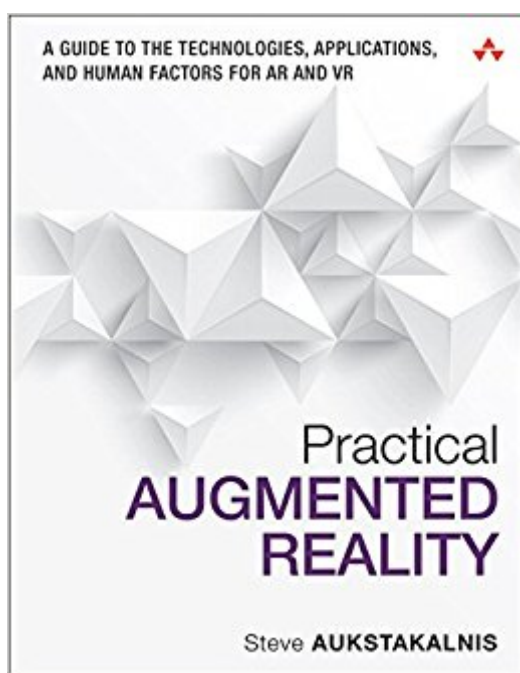


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# Practical Augmented Reality: A Guide To The Technologies, Applications, And Human Factors For AR And VR (Usability)



## Synopsis

This is the most comprehensive and up-to-date guide to the technologies, applications and human factors considerations of Augmented Reality (AR) and Virtual Reality (VR) systems and wearable computing devices. Ideal for practitioners and students alike, it brings together comprehensive coverage of both theory and practice, emphasizing leading-edge displays, sensors, and other enabling technologies and tools that are already commercially available or will be soon. ã ã Beginning with a Foreword by NASA research scientist Victor Luo, Practical Augmented Reality starts by explaining the mechanics of human sight, hearing and touch, showing how these perceptual mechanisms (and their performance ranges) directly dictate the design and use of wearable displays, 3-D audio systems, and tactile/force feedback devices. ã ã The book presents revealing case studies of real-world applications from gaming, entertainment, Big Data visualization, engineering, aeronautics and aerospace, defense, medicine, telerobotics, architecture, law enforcement, and geophysics. Readers will find clear, easy-to-understand explanations, photos, and illustrations of devices including the Atheer AiR, HTC Vive, DAQRI Smart Helmet, Oculus (Facebook) CV1, Sony PlayStation VR, Vuzix M300, Google Glass, and many more. Functional diagrams and photographs clearly explain how these devices operate, and link directly to relevant theoretical and practical content. ã ã Practical Augmented Reality thoroughly considers the human factors of these systems, including sensory and motor physiology constraints, monocular and binocular depth cues, elements contributing to visually-induced motion sickness and nausea, as well as vergence-accommodation conflicts. It concludes by assessing both the legal and societal implications of new and emerging AR, VR, and wearable technologies, as well as provides a look next generation systems.

## Book Information

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## Customer Reviews

“A valuable addition to the library of anyone setting out on their virtual journey.”  
—Dr Rab Scott, Head of VR, Nuclear AMRC  
“A well-presented introduction to advanced visualization technologies, which will provide readers with an informed overview of this fast-paced, high-tech industry.”  
—Chris Freeman, Augmented Reality Technical Fellow, University of Sheffield AMRC  
“Filled with excellent, imaginative information that will inform both experienced and first-time readers alike.”  
—Practical Augmented Reality is worth reading not only for its wealth of data and research, but also for its insights into the markets and opportunities ahead of us. If you have an interest in this exciting new technology, this is a must-have resource and an enjoyable exploration into this brave new world.  
—Roy Taylor, Corporate Vice President for Content and Technology, AMD (Advanced Micro Devices)

“Steven Aukstakalnis stands on the ever-changing edge of the virtual and augmented reality world. Drawing from a rich history in the industry, he is able to share a clear understanding of the technologies, products, and ideas that will reshape the way we work and play. May the knowledge he shares empower you to help create a truly fantastic new future!”

—Brent Baier, Creator of the Peregrine Glove  
“Mixed or augmented reality is a grand frontier not only for computation, but for how people experience their world and each other. This book sets a frame around that which isn’t framed. Read it in order to understand our new world.”  
—Jaron Lanier, Author of Who Owns the Future and You Are Not A Gadget

Steve Aukstakalnis is the former Director of the Virtual Environment and Interactive Systems Program at the National Science Foundation’s Engineering Research Center for Computational Field Simulation. There, his work focused on the application of stereoscopic visually-coupled visual displays and interactive techniques in such areas as architecture, engineering, scientific visualization and national defense. He has served on the research staff at the University of Washington as well as the faculty of Mississippi State University. Steve has served an invited lecturer, instructor and researcher on the topic of virtual reality and advanced visual

simulation for such organizations as the Dept. of Defense, U.S. Army, Naval Oceanographic Office, Nat&apos;l Reconnaissance Office, University of Michigan, Pepperdine University, Purdue, Dartmouth, Nat&apos;l Taiwan University, the Smithsonian Institution and a host of other universities, corporations and government agencies across N. America and around the world.

interesting

Excellent read for anyone looking to learn about AR!

Practical Augmented Reality hit just the right balance, for me, of logical progression through the concepts and their many varied applications with sufficient in-depth treatment of each, leaving you with a coherent grasp of the state of the art and its likely future. The writing style was crisp and well paced, authoritative but still conversational. The illustrations and photos were well selected and just what was needed to get across the current point when and where they appeared. The biology technology connections the author illuminated flowed seamlessly and showed a lot of forethought in how they were presented, as a quick scan of the contents should give you a sense of. I especially liked coming away with a much better appreciation of each of the human senses amazing capabilities, and how each was then tied back into how it relates to AG and VR incorporation, both currently and likely next up. Undergrads and seasoned veterans alike, both should be glad for this timely and comprehensive treatment of AR and it's future promise.

A very recent look at the various forms of virtual reality. Very well-written, in my opinion.

The publisher sent a review copy to me, and I did not rush through this book. Instead, I took the time to thoroughly read it, and I have to say that Practical Augmented Reality is a blockbuster of a technical masterpiece. With the changes in the field of VR and *Augmented Reality* now coming at a break-neck pace, it is increasingly difficult to keep up with all of the advancements that, at times, appear to be coming at us in exponential fashion. We are faced with serious questions as we devise new ways to use these powerful technologies ranging from hard scientific research, medical research, training, surveillance and other "serious" applications, to various applications (and potential applications) in entertainment and media. Mr. Aukstakalnis has, yet again, written "the" definitive, most comprehensive and up-to-date book on this

very large topic and field of endeavor. Just as he did over twenty years ago, with his landmark book *“Silicon Mirage”*, he has once more defined the subject, and helped us to understand it, and hopefully develop it to new levels of excellence. His focus on “human factors” is particularly relevant and important, and should serve as a guideline for industry developers and end-users alike. It is more than clear that the VR genie has developed into something much more expansive, i.e., *“Augmented Reality”*. As we enter this “brave new world”, we are fortunate to have an experienced, expert guide in the person of Steve Aukstakalnis to help us navigate, learn and explore. This book is the gold standard on this topic. There is absolutely no doubt about it.

This book was a very well written overview of AR and its various concepts and challenges. I read the other book on AR by the same publisher (*AR Principles and Practice*) and found this one to be much more accessible. I did finish the two of them and they’re both good. The other one does dive into more nitty gritty detail about things like how computer vision and tracking are actually implemented from a mathematical standpoint, but I’m not really sure that’s necessary for many people. If anyone would ask me today about learning AR/VR/MR, this is the book I would recommend reading to get a solid understanding of the field as opposed to books that only give a superficial treatment of the topic or engender the opposite effect of having your eyes glaze over from too much information.

Steven Aukstakalnis has thoroughly and thoughtfully compiled a serious and comprehensive survey of the emerging field of Augmented Reality. This work dives into the history, science of human perception, evolution of technology, typical use cases, and future of this rapidly advancing Interface paradigm. Anyone interested in the field of AR (Augmented Reality), VR (Virtual Reality) and MR (Mixed Reality) will easily become an expert by absorbing the explanation, referencing and factual documentation contained in this well-sourced, carefully developed resource. Aukstakalnis has generously and abundantly shared and organized his many years of profession experience with these leading-edge tools, technology and theory. *“Practical Augmented Reality”* is an impressive and concise work, immediately accessible to those without the benefit of the time and experience to invest in acquiring and analyzing this wide body of knowledge. I would highly recommend this book to anyone seeking to obtain a strategic advantage in this rapidly accelerating field and product development. Whether you are a CTO of a major company, academic researcher or merely a

technology enthusiast, this work is a valuable guide toward your ongoing examination and analysis of this exciting, evolving area of focus. Gregory Panos, Futurist, Educator and Inventor in the field of Virtual / Augmented Reality

As a millennial we're bound to be well equipped and wired to tech-savvy gadgets. Our interest in the future is vital and new technology is continuously growing. Virtual Reality is on a rise. This book gives you the fundamental break down of how VR/AR and how it's used today. I was surprised how much technology uses virtual and augmented reality but we are at the surface. This book offers comprehensive uses and understanding on how the technology is growing into the future. This book is dope.

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