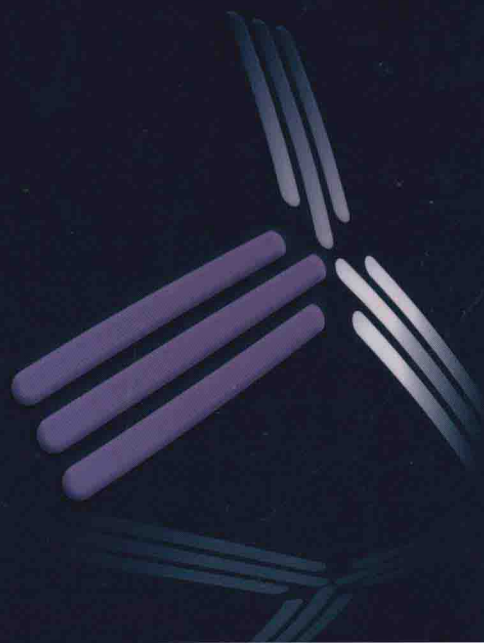


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AUGMENTED REALITY

An Emerging Technologies Guide to AR

Gregory Kipper
Joseph Rampolla



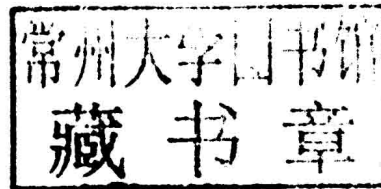
Augmented Reality

An Emerging Technologies
Guide to AR

First Edition

Gregory Kipper

Joseph Rampolla



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Augmented Reality

*“To my admirably patient wife Amber for enduring this whole process yet again,
and to my wonderful children – Azure, McCoy, and Grant”*

– Greg Kipper

“To my loving wife Pamela, and my children – Stephen, Meghan, and Sean”

– Joe Rampolla

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Gregory Kipper

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Joe Rampolla

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About the Authors

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Foreword

Augmented reality (AR) is a technology whose time has come. Conceived in rudimentary form as early as the 1960's, AR is only now becoming truly practical. Recent advances in mobile processing, coupled with an explosion in digital storage capacity, ubiquity of wireless broadband connections, mass adoption of smart phones, and the limitless data store that the Internet has gathered all the prerequisites for this potentially game-changing technology. Consumer AR applications are already present on hundreds of millions of smart phones (utilizing built-in cameras, accelerometers, microphones, and GPS), and with the development of new AR-specific chipsets from major chip companies like Nvidia and Qualcomm, the AR price-point, and the bar for entry to potential AR app-developers will be lowered further. In short: a critical mass is forming to support augmented reality products and services as a major tech/media industry.

But what is AR—and more importantly, what will be the consequences to human society when augmented reality applications go mainstream? What will be the risks and rewards? At present AR is being treated as a novelty—used to attract young eyeballs for softdrink, video game, and movie ads. However, as a three-dimensional cousin of the Internet, AR is likely to travel a similar path from novelty, to over-hyped panacea and threat, and finally to massive utility and foundational infrastructure. Along the way, individuals and companies who blaze a trail will rise and fall, but the demonstrated usefulness of AR to a broad variety of human activities augurs well for the industry's future.

It's no coincidence that one of the biggest potential uses for AR is also where the Internet shines: in democratizing access to information. This goes beyond access to trivia to include serious training and education. Entire online degree programs already pepper the Internet (in fact, free online courses are now being offered by both Harvard and M.I.T.). However, AR can take training and education even further by displaying interactive information in geospatial context—greatly enhancing its usefulness. For example, rather than reading about how to operate complex equipment, one might be able to project the apparition of a world class expert onto the scene to demonstrate first hand. Likewise, in emergency situations one might be able to call up an in-place demonstration of proper CPR technique, projected over one's hands. This takes advantage of humanity's powerful ability to absorb visual information—a trait our ancestors evolved to seek out danger in their surroundings.

From entertainment to training and education, law enforcement, military, political, legal—many industries and activities stand to gain from the advent of widespread AR technology. And yet, AR is no different from any other human endeavor; there will be hazards with this new technology as well. Unintended second and third order

effects of mass adoption of AR will no doubt present complex legal and social issues never before imagined—as occurred with the advent of the Internet.

For example, facial recognition, license plate readers, bluetooth ID's, and a host of other de-anonymizing technologies coupled with an AR headset could make it possible for individuals navigating a public street to instantly retrieve detailed information on people passing by. From criminals looking for likely marks to advertisers, to law enforcement, to employers evaluating job applicants. What are the legal and social implications of the vast stores of data held about us—in the past most likely available on the Internet—but now literally hovering above our heads in a dimension visible only to certain members of society but not others? What will be the disclosure rules for passive monitoring of passers-by? Is there a reasonable expectation of privacy against data-mining in public even though a shallower privacy is not expected? What are the liability issues for the manufacturers and developers of AR games whose products might obscure actual reality enough for players to get hit by a bus? Likewise, criminals are the quintessential early adopters, always seeking advantage by being the first to try tools that might give them an unfair advantage. It is a good bet that AR will be utilized in confidence schemes to act out the latest version of the 'Nigerian Prince' scam, this time on a sidewalk with a 'long-lost friend' you have just bumped into who seems to remember every single thing about you—even though you cannot place them. Likewise with expert knowledge; does that person you are speaking to really know Coleridge's 'Rime of the Ancient Mariner' by heart, or are they simply reading from an AR teleprompter to impress you? What if that is your lawyer speaking in your defense while in court? Would AR make it less likely to matter if a person actually **knows** something as long as they can reference the information quickly?

The social trust that binds society is about to be tested by AR even as our own capabilities are expanded by its usefulness. For both adherents to AR technology and those who need to understand its impacts, now is the time to delve into these possibilities. Reading this book will give you a head start.

Daniel Suarez

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