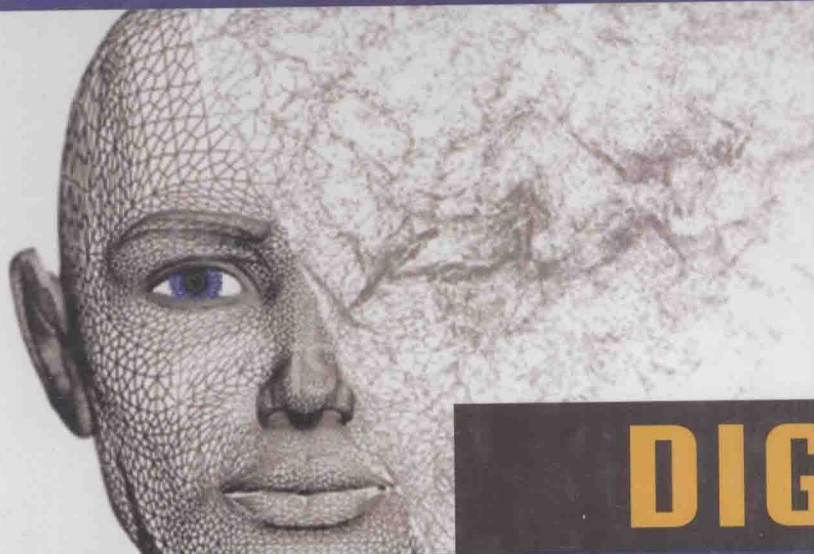Theory and Practice

DIGITAL
Character Development

Rob O'Neill

Digital Character Development:
Theory and Practice

Rob O'Neill

Pratt Institute,
Digital Arts Research Laboratory
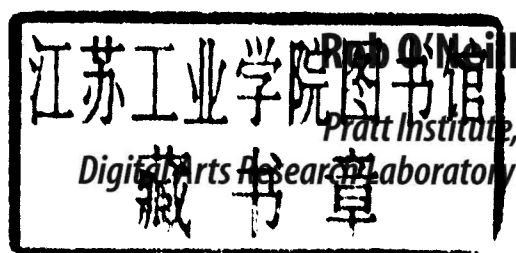
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Foreword

Animation involves breathing life into things. The word *animation* comes from the Proto-Indo-European root *ane-*, meaning "to breathe," via the Latin *anima*, meaning "living spirit." The spirit of animation lies in the characters—entities that people feel are alive (and possibly even sentient) when they engage with them.

Computer animation specifically involves breathing life into things by means of electronic systems that perform millions of calculations each second. Computers have the capability to present complex characters and the intricate worlds they inhabit in ways that draw people in and help us see past the vast arrays of binary digits inside the box. The only challenge is that someone has to tell the computer how to twiddle all those bits.

Breathing life into computer characters is a tricky blend of artistry and technology. The artistic side of this process entails a subtle understanding of both the characters in the animation and the audience to whom those characters are being presented. Great animation requires intuition and finesse, and certain effortlessness that facilitates the audience's suspension of disbelief. Underlying this artistry is an array of fields ranging from graphic design and cinematography all the way to psychology, anatomy, and physics.

Being a skilled computer animator also entails a rigorous understanding of a wide range of arcane technological skills. Terms like "quaternions," "matrices," and "inverse kinematics" are tossed around like grenades. To make the challenge even greater, the hardware and software underlying computer animation change so rapidly that it is hard to keep pace. Thus, computer animation requires a simultaneous grasp on both the esoteric and the cutting-edge.

Rob O'Neill is one among a small group of people in the world who can address both the artistry and technology of animation with equal skill. In this book, Rob provides a comprehensive treatment of several disparate yet interconnected parts, covering the overlap of anatomy, artistry, technology, mathematics, and many other elements that are critical to the creation of digital characters. Rob skillfully illuminates the complex interdependencies among such seemingly distinct aspects of animation and helps the reader understand why it is important to treat all of these issues together. You have chosen a wise guide through the lush jungle of computer animation.

This book is relevant to practicing animators, animation students, researchers, and anyone else who may have interest to know how animation works. It is not just a technical manual and not just a theoretical exploration of the creative process; it is both at once. As such, it gets to the heart of computer animation—an incredibly precise and exacting craft that seeks to produce characters with elegance, subtlety, love, fear, anguish, humor, and compassion.

– Bill Tomlinson
University of California, Irvine

Acknowledgments

Introduction

Digital characters are a driving force in the entertainment industry today. Every animated film and video game production spends a large percentage of its resources and time on advancing the quality of the digital characters inhabiting the world that they are creating. We have entered an era when digital characters have reached a level of sophistication that has prompted some critics to question if a digital actor can win an Academy Award for acting. As artificial intelligence and behavioral animation become more integrated with hand-animated entities, we will see a dramatic increase in the realism and interactivity of these characters. Practitioners of the subject will also require a deeper understanding of the underlying conceptual foundation as the complexity of the technology increases. The field of character technology has matured into a topic that spans the realms of anatomy, animation, computer science, performance, and behavioral psychology. The contemporary uses of digital characters are varied and range from purely entertainment to biomedical, industrial simulation, and beyond. This book is an overview of the history, theory, and methods for creating digital characters. Many books cover the step-by-step creation of digital characters using a particular piece of software. This book forgoes existing software and deals with the concepts from a software-agnostic point of view.

Recently, characters such as Gollum from "The Lord of the Rings" series (2001–2004) and Davy Jones from the "Pirates of the Caribbean" series (2006–2007) have both been discussed with regard to earning awards for achievement in acting. Almost more compelling, a recent panel entitled "The Biology of King Kong," part of the 2006 Tribeca Film Festival, included a discussion on how "King Kong" (2005) was incredibly true to life and believable as a real gorilla. Panel member, Roger Fouts, Co-Director of the Chimpanzee and Human Communication Institute, discussed how pleased he was that the rise in technology and artistry has allowed for digital doubles and replacements for roles that were usually reserved for trained animals. While most critics are waiting for a believable human replacement, there is no better compliment for the team that created this digital character and no better indicator for the potential of character technology.

–Rob O'Neill

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