

Advanced Methods in Computer Graphics

Ramakrishnan Mukundan

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With examples in OpenGL



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R. Mukundan
Department of Computer Science and Software Engineering
University of Canterbury
Christchurch, New Zealand

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*To my daughter
Lalitha*

Preface

The field of Computer Graphics has evolved rapidly over the past decade following the development of a large collection of algorithms and techniques for various applications in modelling, animation, visualisation, real-time rendering and game engine design. Advances in graphics hardware capabilities and processor technology have continuously fuelled this growth. As a result, this field continues to have enormous potential for further research and development. Computer graphics has also been one of the popular subjects in the computer science and computer engineering disciplines for several years. It is a field where one could always find new and interesting ideas, elegant algorithms and robust implementations.

I have been teaching both introductory and advanced courses on computer graphics for the past 12 years, and have constantly observed the enthusiasm of students in learning as well as mastering various techniques used for three-dimensional modelling, rendering and animation. The visual effects some of these methods produce captivate their interest, and motivate them to further study and research more advanced techniques. This book evolved from a compilation of my lecture notes and reference material for a graduate course in advanced computer graphics taught in the Department of Computer Science and Software Engineering at the University of Canterbury. The primary aim of this book project has been to develop a reference text suitable for both students and researchers, providing an in-depth and comprehensive coverage of important methods that are useful in the field of character animation. Working towards this goal, I soon realised that a book covering a large number of subfields ranging from physically based simulation to non-photorealistic rendering would be a highly ambitious project. This book includes a selection of topics which I consider as fundamental to the area of animation and rendering, and I hope that it will contribute to a deeper and broader understanding of key algorithms used in advanced computer graphics.

I am very much indebted to the graduate students and staff in the Department of Computer Science and Software Engineering, University of Canterbury, for their support, valuable feedback, and encouragement. My sincere thanks go to Dr. Richard Lobb (Adjunct Senior Fellow, Department of Computer Science and Software Engineering, University of Canterbury) for devoting so much of his

valuable time and expertise for reviewing the manuscript. I am thankful to Dr. Christian Long (Department of English, University of Canterbury), for copy-editing the manuscript. His thorough and meticulous checking of spelling, punctuation and grammar has helped improve the clarity of the material presented.

I would like to thank the editorial team members for their help throughout this book project. While the manuscript was being prepared, a series of unfortunate events, including the passing away of my mother, and two major earth quakes in Christchurch, brought the progress to a standstill for several months. Special thanks to Helen Desmond and Beverley Ford for their continuous encouragement. They showed a tremendous amount of patience, and always so kindly agreed to extend the manuscript submission deadline a number of times.

I am very grateful to my family for their endless support. I greatly appreciate their patience and understanding throughout the time when I was obsessed with writing this book.

Department of Computer Science
and Software Engineering
University of Canterbury
Christchurch, New Zealand

R. Mukundan

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