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Image Processing for Computer Graphics and Vision

Second Edition

Springer

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To Solange and Daniel

To Noni and Alice

To Enilson

Preface

A escrita é a forma mais duradoura de conservar nossos pensamentos. Através dela, nos é permitido transmitir, de geração em geração, a essência de nossas reflexões sobre a vida, a humanidade e, sobretudo, o amor.

Solange Visgueiro

This book originated when we noticed, several years ago, that the importance of image processing in the area of visualization and computer graphics was not reflected in either the existing curricula or the current textbooks.

On the one hand, traditional image processing books do not cover important topics for computer graphics such as warping, morphing, digital compositing, color quantization, and dithering. Often even basic facts about signals are not adequately discussed in the context of graphics applications. This kind of knowledge is now more important than ever for computer graphics students, given the interactions between audio, images, and models in most applications.

Computer graphics books, on the other hand, emphasize primarily modeling, rendering, and animation, and usually do not contain a proper exposition of signal processing techniques.

We have adopted a conceptual approach, with emphasis on the mathematical concepts and their applications. We introduce an abstraction paradigm that relates mathematical models with image processing techniques and implementation methods. This paradigm is used throughout the book, and helps the reader understand the mathematical theory and its practical use. At the same time, we keep the presentation as elementary as possible by sacrificing mathematical rigor, when necessary, for an intuitive description.

This book is intended to be useful either as a textbook or as a reference book. In draft form and after publication, the Portuguese edition has been used since 1992 at a course taught at Instituto de Matemática Pura e Aplicada (IMPA) in Rio de Janeiro, attended by undergraduate and master's students in mathematics and computer science. Chapters 1 through 7 correspond to the course's contents; the remaining chapters have been used as topics for discussion and seminars with the students. The English version has been in use outside Brazil since the fall of 1996. The initial edition of the book had a

strong emphasis on deterministic image models. The current extended edition of the book includes also stochastic image models, as well as applications in Computer Vision. The book in its present form can thus be used more flexibly for teaching or research.

Acknowledgments

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We are grateful to numerous colleagues who contributed their comments and criticism to this work: André Antunes, Bruno Costa, Lucia Darsa, Marcelo Dreux, Luiz Henrique de Figueiredo, and Valéria Iório, among others. We also thank Siome Goldenstein and Paulo Roma, who helped us revise the translation. We acknowledge the editorial work of Martin Gilchrist and Wayne Wheeler of Springer-Verlag, who respectively agreed to publish the first and second editions of this book.

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