

An Interdisciplinary Introduction to Image Processing: Pixels, Numbers, and Programs (MIT Press)

By Steven L. Tanimoto

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This book explores image processing from several perspectives: the creative, the theoretical (mainly mathematical), and the programmatical. It explains the basic principles of image processing, drawing on key concepts and techniques from mathematics, psychology of perception, computer science, and art, and introduces computer programming as a way to get more control over image processing operations. It does so without requiring college-level mathematics or prior programming experience. The content is supported by PixelMath, a freely available software program that helps the reader understand images as both visual and mathematical objects.

The first part of the book covers such topics as digital image representation, sampling, brightness and contrast, color models, geometric transformations, synthesizing images, stereograms, photomosaics, and fractals. The second part of the book introduces computer programming using an open-source version of the easy-to-learn Python language. It covers the basics of image analysis and pattern recognition, including edge detection, convolution, thresholding, contour representation, and K-nearest-neighbor classification. A chapter on computational photography explores such subjects as high-dynamic-range imaging, autofocusing, and methods for automatically inpainting to fill gaps or remove unwanted objects in a scene. Applications described include the design and implementation of an image-based game. The PixelMath software provides a "transparent" view of digital images by allowing the user to view the RGB values of pixels by zooming in on an image. PixelMath provides three interfaces: the pixel calculator; the formula page, an advanced extension of the calculator; and the Python window.

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Editorial Review

Review

Finally, there is an introductory level image processing book that is written in a truly multi-disciplinary way! By approaching the material in a horizontal rather than vertical fashion, Steven Tanimoto has created an accessible resource that should have broad impact and appeal. I hope others will follow his lead and approach their subject areas in a similar way.

(**Tony DeRose**, Senior Scientist, Pixar Animation Studios)

Due to heavy prerequisite requirements, image processing is typically an option only for students who have already taken enough programming and math courses. This book presents an effective approach to address this issue by carefully balancing programming and math requirements, making image processing accessible to junior (or even sophomore) students, as well as to non-majors.

(**George Bebis**, Director of Computer Vision Laboratory, University of Nevada)

This new book is suitable for audiences in interdisciplinary areas with applications of image processing. Steven Tanimoto uses an intuitive and efficient structure to describe image processing topics, and offers many illustrations using PixelMath, a unique image processing program.

(**Lijun Yin**, Department of Computer Science, Binghamton University)

About the Author

Steven L. Tanimoto is Professor of Computer Science and Engineering at the University of Washington.

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