AJNR

Principles and Advanced Methods in Medical Imaging and Image Analysis

AJNR Am J Neuroradiol 2009, 30 (6) e91
doi: https://doi.org/10.3174/ajnr.A1585
http://www.ajnr.org/content/30/6/e91

BOOK REVIEW

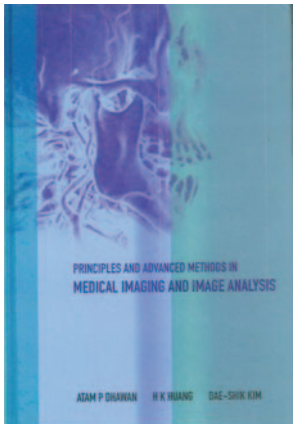
Principles and Advanced Methods in Medical Imaging and Image Analysis

A.P. Dhawan, H.K. Huang, D.-S. Kim, eds. World Scientific Publishing; 2008, 868 pages, $228.00.

At first glance at the cover and size of *Principles and Advanced Methods in Medical Imaging and Image Analysis*, a passerby might think that it is the latest Harry Potter novel; however, the gadgets and technology described in its text are far more complex than those seen in Hogwarts School of Witchcraft and Wizardry. The authors undertook the very difficult task of describing the principles of imaging such that the imaging novice could quickly move from the purpose of a particular technique to the mathematics, physics, and engineering that make it possible. Engineers, researchers, and clinical students with strong backgrounds in physics and mathematics may find this book useful when embarking on studies of imaging technology.

The book is organized into 3 parts, each containing a number of chapters written by various authors. Given the multitude of authors, the language and writing styles are remarkably cohesive. The first section covers principles of imaging and image analysis. It begins with an overview chapter on principles of image formation in x-rays, MR imaging, single-photon emission tomography, positron-emission tomography, and sonography and describes a linear spatially invariant model of image formation. Subsequent chapters explore radiography, nuclear medicine, MR imaging, and sonography in greater detail. Chapters 6 and 7 focus on instrumentation and image processing, including multidimensional image reconstruction methods. In chapters 9 and 10, image segmentation and classification methods are described.

The second section explores recent advances in medical imaging applications. Chapters 11 and 12 review functional MR imaging, diffusion-weighted and diffusion tensor imaging, and their applications in fundamental research of neural pathways. Chapter 13 reviews optical imaging techniques, such as fluorescence microscopic imaging, and how these techniques can be applied to planar and tomographic macroscopic applications. Chapter 14 shows how algorithms can be developed for tracking the endocardium with dynamic sonography. Chapters 15–23 deal with new techniques in image processing. Highlights include using multivariate statistical estimation methods for image reconstruction, techniques of image registration and fusion, and wavelet transforms. Practical issues, such as medical imaging databases, registration methods for computational atlases, and information integrity, are also addressed.



The third section describes various medical imaging applications, case studies, and future trends. Innovations in imaging processing impact both diagnosis and treatment as described in a number of chapters reviewing applications for radiation therapy. Examples of future technical advances are described in discussions of neuroimaging, including dynamic brain mapping methods and model-based image analysis for diffusion tensor MR imaging. The book ends by exploring expectations of improved patient care and research through high-resolution medical imaging, intelligent image analysis, and smart data-management systems.

The various subjects are covered in great detail, citing relevant recent literature. The authors start their chapters with a fairly basic description of their topic and rapidly lead into complex explanations using mathematic descriptions. The intended audiences are engineers and researchers who seek an overview of the principles behind today's most advanced imaging techniques. This book would prove very useful for engineering students exploring medical imaging projects, because it provides a rapid review of the literature in sufficient detail to stimulate new thoughts and ideas. There are numerous career opportunities in this field and *Principles and Advanced Methods in Medical Imaging and Image Analysis* would be a great resource for a technical foundation.

DOI 10.3174/ajnr.A1585