

Preface

This book had its genesis in 2003, when Dr. Lixu Gu of Shanghai Jiatong University asked whether we would consider organizing a workshop on image-guided interventions at the 2005 International Symposium on Engineering in Medicine and Biology in Shanghai, China. We agreed and our subsequent workshop included five individual speakers and covered neurological, orthopedic, and abdominal applications of image-guided interventions, with the inclusion of issues on visualization and image processing. After the symposium, Springer-Verlag approached us about editing a book on the basis of the workshop, and we decided that such a book would indeed fill a niche in the literature, but to do its justice, it would need to cover more than the original five topics.

We asked Jackie Williams to take on the role of Executive Editor, and over the next six months, we received agreement from the authors represented in this book, which includes 18 chapters divided between principles and applications. The title, “Image-Guided Interventions” was deliberately chosen over “Image-Guided Surgery” or “Minimally-Invasive Surgery and Therapy,” as it covers the widest range of both therapeutic and surgical procedures, and reflects the recognition that the basic principles covered in the first part of the book are applicable to all such procedures. In addition, the inclusion of two chapters dealing with radiation-based therapies recognizes the convergence between surgery and radiation therapy in terms of the guidance technologies.

This book is aimed at both the graduate student embarking on a career in medical imaging, and the practicing researcher or clinician who needs a snapshot of the state-of-the-art in both the principles and practice of this discipline. Accordingly, the book begins with a historical overview of the development of image guidance for medical procedures, and follows with discussions of the critical components of tracking technologies, visualization, augmented reality, image registration (both rigid and nonrigid) image segmentation, and image acquisition. A chapter on the important issue of software development for image-guided systems is also included, as is one on the equally important issue of validation.

In the application section, examples are presented on the use of image guidance for focused ultrasound therapy, neurosurgery, orthopedics, abdominal surgery, prostate therapy, and cardiac applications. Finally, the linkages between image-guided surgery and radiation therapy are highlighted in chapters on the clinical application of radiosurgery and radiation oncology.

We sincerely thank our colleagues for agreeing to assist us in this endeavor, and for putting up with our incessant demands over the past year.

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November 2007



<http://www.springer.com/978-0-387-73856-7>

Image-Guided Interventions

Technology and Applications

Peters, T.; Cleary, K. (Eds.)

2008, XXXII, 557 p., Hardcover

ISBN: 978-0-387-73856-7