Preface

Due to technology innovations, the applications of medical imaging in orthopaedic interventions are pervasive, ranging from diagnosis and pre-operative surgical planning, intra-operative guidance and post-operative treatment evaluation and follow-up. The rapid adoption of DICOM standard makes the large image databases readily available in orthopaedics for multi-modal, multi-temporal and multi-subject assessment. Consequently, accurate and (semi-) automatic quantitative image computing is indispensable for various orthopaedic inventions, leading to the creation of a new emerging field called computation radiology. The past two decades have witnessed a rapid development and applications of computational radiology.

Responding to the continued and growing demand for computational radiology, this book provides a cohesive overview of the current technological advances in this emerging field, and their applications in orthopaedic interventions. It discusses the technical and clinical aspects of computational radiology and covers intra-operative imaging and computing for orthopaedic procedures. The book is aimed at both the graduate students embarking at a career in computational radiology, and the practicing researchers or clinicians who need an update of the state of the art in both the principles and practice of this emerging discipline.

Contributed by the leading researchers in the field, this book covers not only the basic computational radiology techniques such as statistical shape modelling, CT/MRI segmentation, augmented reality and micro-CT image processing, but also the applications of these techniques to various orthopaedic interventional tasks. Details about following important state-of-the-art development are featured: 3D pre-operative planning and patient-specific instrumentation for surgical treatment of long-bone deformities, computer-assisted diagnosis and planning of periacetabular osteotomy and femoroacetabular impingement, 2D–3D reconstruction-based planning of total hip arthroplasty, image fusion for computer-assisted bone tumour surgery, intra-operative three-dimensional imaging in fracture treatment, augmented reality-based orthopaedic interventions and education, medical robotics for musculoskeletal surgery, inertial sensor-based cost-effective surgical navigation and computer-assisted hip resurfacing using patient-specific instrument guides.

We sincerely thank our colleagues for their hard work in making their contributions and reviewers for providing timely reviews to us. Special thanks to Ms. Alice Ko who coordinated the long and difficult process of editing and review. Finally, we deeply appreciated the intention of the publisher to make this book possible.

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