Lecture Notes in Computational Vision and Biomechanics

Volume 8

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This book is the eighth volume to be published in the Book Series "Lecture Notes in Computational Vision and Biomechanics (LNCV&B)".

The research related to the analysis of living structures (Biomechanics) has been a source of recent research in several distinct areas of science, for example, Mathematics, Mechanical Engineering, Physics, Informatics, Medicine and Sport. However, for its successful achievement, numerous research topics should be considered, such as image processing and analysis, geometric and numerical modelling, biomechanics, experimental analysis, mechanobiology and enhanced visualization, and their application to real cases must be developed and more investigation is needed. Additionally, enhanced hardware solutions and less invasive devices are demanded.

On the other hand, Image Analysis (Computational Vision) is used for the extraction of high level information from static images or dynamic image sequences. Examples of applications involving image analysis can be the study of motion of structures from image sequences, shape reconstruction from images and medical diagnosis. As a multidisciplinary area, Computational Vision considers techniques and methods from other disciplines, such as Artificial Intelligence, Signal Processing, Mathematics, Physics and Informatics. Despite the many research projects in this area, more robust and efficient methods of Computational Imaging are still demanded in many application domains in Medicine, and their validation in real scenarios is matter of urgency.

These two important and predominant branches of Science are increasingly considered to be strongly connected and related. Hence, the main goal of the LNCV&B book series consists of the provision of a comprehensive forum for discussion on the current state-of-the-art in these fields by emphasizing their connection. The book series covers (but is not limited to):

- Applications of Computational Vision and Biomechanics
- Biometrics and Biomedical Pattern Analysis
- Cellular Imaging and Cellular Mechanics
- Clinical Biomechanics
- Computational Bioimaging and Visualization
- Computational Biology in Biomedical Imaging
- Development of Biomechanical Devices
- Device and Technique Development for Biomedical Imaging
- Experimental Biomechanics
- Gait & Posture Mechanics
- Grid and High Performance Computing for Computational Vision and Biomechanics
- Image Processing and Analysis
- Image Processing and Visualization in Biofluids
- Image Understanding
- Material Models
- Mechanobiology
- Medical Image Analysis
- Molecular Mechanics
- Multi-Modal Image Systems
- Multiscale Biosensors in Biomedical Imaging
- Multiscale Devices and Biomems for Biomedical Imaging
- Musculoskeletal Biomechanics
- Multiscale Analysis in Biomechanics
- Neuromuscular Biomechanics
- Numerical Methods for Living Tissues
- Numerical Simulation
- Software Development on Computational Vision and Biomechanics
- Sport Biomechanics
- Virtual Reality in Biomechanics
- Vision Systems

In order to match the scope of the LNCV&B book series, each book must include contents relating to or combining both Image Analysis and Biomechanics. Proposals for new books are welcome and should be submitted to the editors of the book series.

The Editors would like to take this opportunity to thank once again to all members of the Advisory Board for their support in the establishment and scientific managing of this book series, and also to Nathalie Jacobs and Anneke Pot for their assistance.

João Manuel R. S. Tavares
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(LNCV&B book series editors)

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Topics in Medical Image Processing and Computational Vision

Springer

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Preface

This book presents novel and advanced Topics in Medical Image Processing and Computational Vision in order to solidify knowledge in the related fields and define their key stakeholders.

The sixteen chapters included in this book were written by invited experts of international recognition and address important issues in Medical Image Processing and Computational Vision, including: Object Recognition, Object Detection, Object Tracking, Pose Estimation, Facial Expression Recognition, Image Retrieval, Data Mining, Automatic Video Understanding and Management, Edges Detection, Image Segmentation, Modelling and Simulation, Medical Thermography, Database Systems, Synthetic Aperture Radar and Satellite Imagery.

Different applications are addressed and described throughout the book, comprising: Object Recognition and Tracking, Facial Expression Recognition, Image Database, Plant Disease Classification, Video Understanding and Management, Image Processing, Image Segmentation, Bio-structure Modelling and Simulation, Medical Imaging, Image Classification, Medical Diagnosis, Urban Areas Classification and Land Map Generation.

Therefore, this book is of crucial effectiveness for Researchers, Students, End Users and Manufacturers from several multidisciplinary fields, as the ones related with Artificial Intelligence, Bioengineering, Biomechanics, Computational Mechanics, Computational Vision, Computer Sciences, Human Motion, Mathematics, Medical Image, Medicine, Pattern Recognition and Physics.

The Editors would like to take this opportunity to thank all invited authors for sharing their works, experiences and knowledge, making possible their dissemination through this book.

João Manuel R. S. Tavares
Renato M. Natal Jorge

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