

Lecture Notes in Computational Vision and Biomechanics

Volume 15

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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):

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Preface

Computational vision domain presents a multidisciplinary nature involving different applications in society. Medicine, material science, surveillance, biometric, robotics, defence, satellite data, traffic analysis, and architecture, among other areas, use signal and image processing and analysis, arousing interest in methodological and applicative aspects.

Due to its intrinsic interdisciplinary aspects, different approaches, such as optimization methods, geometry, principal component analysis, stochastic methods, neural networks, and fuzzy logic, are currently discussed by the Researchers.

Several research fields related to the acquisition, the use and the analysis of images are involved in the areas of image processing and analysis, image segmentation, 2D and 3D reconstruction, data acquisition, interpolation and registration, scientific data visualization, remote sensing, modeling and simulation, biometric recognition, medical imaging, motion and deformation analysis, material science, computer vision in robotics and automation, and architecture.

This book contains extended versions of selected papers presented at the third edition of the *International Symposium CompIMAGE 2012: Computational Modeling of Object Presented in Images: Fundamentals, Methods and Applications*, that was held in Rome, at the Department of Computer, Control, and Management Engineering Antonio Ruberti of Sapienza University of Rome, September 2012. *CompIMAGE 2012* brought together researchers representing several fields such as Biomechanics, Engineering, Medicine, Mathematics, Physics, Statistic, and Architecture, presenting new trends in these fields. In particular, the latter topic, which was addressed for the first time in this edition, due to the particularity of the hosting Country for what concerns the Historical, Architectural, Cultural, and urban heritages resources, puts in evidence the important role that images also have in such less technical fields.

The Editors wish to thank all the *CompIMAGE 2012* Authors, Invited Lecturers, and members of the Scientific Committee for sharing their expertise, and also to the Department of Computer, Control, and Management Engineering Antonio Ruberti, the University of Rome La Sapienza, The Italian Group of Fracture (IGF), the Consorzio Interuniversitario Nazionale per l'Informatica (CINI), Sapienza Innovazione, Zêtema Progetto Cultura S.r.l, the Universidade do Porto (UP), the Faculdade de Engenharia da Universidade do Porto (FEUP), the Fundação para a Ciência e a Tecnologia (FCT), the Instituto de Engenharia Mecânica (IDMEC-

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