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Reneta P. Barneva · Valentin E. Brimkov
João Manuel R. S. Tavares (Eds.)

Combinatorial Image Analysis

19th International Workshop, IWCIA 2018
Porto, Portugal, November 22–24, 2018
Proceedings

Editors

Reneta P. Barneva
State University of New York at Fredonia
Fredonia, NY, USA

João Manuel R. S. Tavares 
University of Porto
Porto, Portugal

Valentin E. Brimkov
State University of New York
Buffalo, NY, USA

and

Institute of Mathematics and Informatics
Bulgarian Academy of Sciences
Sofia, Bulgaria

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Preface

This volume contains the proceedings of the 19th International Workshop on Combinatorial Image Analysis (IWCIA 2018) held in Porto, Portugal, November 22–24, 2018.

Image analysis provides theoretical foundations and methods for solving real-life problems arising in various areas of human practice, such as medicine, robotics, defense, and security. Since typically the input data to be processed are discrete, the “combinatorial” approach to image analysis is a natural one and therefore its applicability is expanding. Combinatorial image analysis often provides advantages in terms of efficiency and accuracy over the more traditional approaches based on continuous models that require numeric computation.

The IWCIA workshop series provides a forum for researchers throughout the world to present cutting-edge results in combinatorial image analysis, to discuss recent advances and new challenges in this research area, and to promote interaction with researchers from other countries. IWCIA had successful prior meetings in Paris (France) 1991, Ube (Japan) 1992, Washington DC (USA) 1994, Lyon (France) 1995, Hiroshima (Japan) 1997, Madras (India) 1999, Caen (France) 2000, Philadelphia, PA (USA) 2001, Palermo (Italy) 2003, Auckland (New Zealand) 2004, Berlin (Germany) 2006, Buffalo, NY (USA) 2008, Playa del Carmen (Mexico) 2009, Madrid (Spain) 2011, Austin, TX (USA) 2012, Brno (Czech Republic) 2014, Kolkata (India) 2015, and Plovdiv (Bulgaria) 2017. The workshop in Porto retained and enriched the international spirit of these workshops. The IWCIA 2018 Program Committee members are renowned experts coming from 17 different countries in Asia, Europe, North and South America, and the authors come from 12 different countries.

Each submitted paper was sent to at least three reviewers for a double-blind review. EasyChair provided a convenient platform for smoothly carrying out the rigorous review process. The most important selection criterion for acceptance or rejection of a paper was the overall score received. Other criteria included: relevance to the workshop topics, correctness, originality, mathematical depth, clarity, and presentation quality. We believe that as a result only papers of high quality were accepted for presentation at IWCIA 2018 and for publication in this volume.

The program of the workshop included presentations of contributed papers and keynote talks by three distinguished scientists. The talk of José M. Bioucas-Dias (University of Lisbon, Portugal) presented methods for solving certain inverse problems of interferometric phase imaging, aimed at the estimation of phase from sinusoidal and noisy observations. He proposed characterizations of the obtained estimates and illustrated their effectiveness by results of extensive experiments with simulated and real data. Jan Kratochvíl (Charles University, Czech Republic) reviewed various problems on intersection, contact, or visibility representations of graphs, which are a natural way of graph and network visualization. He surveyed known results on these classes of graphs and discussed new as well as persisting open problems. Nicolai

Petkov (University of Groningen, The Netherlands) presented novel trainable filters as an alternative to deep networks for the extraction of effective representations of data for the purposes of pattern recognition. He discussed the advantages of this approach and illustrated it on handwritten digit images, traffic signs, and sounds in audio signals.

The contributed papers are grouped into two sections. The first one includes nine papers devoted to theoretical foundations of combinatorial image analysis, including digital geometry and topology, array grammars, tilings and patterns, discrete geometry in non-rectangular grids, and other technical tools for image analysis. The second part includes nine papers presenting application-driven research on topics such as discrete tomography, image segmentation, texture analysis, and medical imaging. We believe that many of these papers would be of interest to a broader audience, including researchers in scientific areas such as computer vision, shape modeling, pattern analysis and recognition, and computer graphics.

A special session provided some authors with the opportunity to present their ongoing research projects and original works in progress. The texts of these works are not included in this volume.

Many individuals and organizations contributed to the success of IWCIA 2018. The editors are indebted to IWCIA's Steering Committee for endorsing the candidacy of Porto for the 19th edition of the workshop. We wish to thank everybody who submitted their work to IWCIA 2018; thanks to their contributions, we succeeded in having a technical program of high scientific quality. We are grateful to all participants and especially to the contributors of this volume. Our most sincere thanks go to the IWCIA 2018 Program Committee whose cooperation in carrying out high-quality reviews was essential in establishing a strong scientific program. We express our sincere gratitude to the keynote speakers, José M. Bioucas-Dias, Jan Kratochvil, and Nicolai Petkov for their excellent talks and overall contribution to the workshop program.

The success of the workshop would not be possible without the hard work of the local Organizing Committee. We are grateful to our partners: FEUP – Faculdade de Engenharia da Universidade do Porto; LABIOMEP: Laboratório de Biomecânica do Porto; APMTAC – Associação Portuguesa de Mecânica Teórica, Aplicada e Computacional; FCT – Fundação para a Ciência e a Tecnologia; INEGI – Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial; ITHEA ISS – International Scientific Society; and Taylor & Francis Group. Finally, we wish to thank Springer, and especially Alfred Hofmann and Anna Kramer, for their efficient and kind cooperation in the timely production of this book.

October 2018

Reneta P. Barneva
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João Manuel R. S. Tavares

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