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# Combinatorial Image Analysis

15th International Workshop, IWCIA 2012  
Austin, TX, USA, November 28-30, 2012  
Proceedings



Springer

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# Preface

This volume contains the articles presented at the 15th International Workshop on Combinatorial Image Analysis, IWCIA 2012, which was held in Austin (TX), November 28–30, 2012. The 14 previous meetings were held in Paris (France) 1991, Ube (Japan) 1992, Washington DC (USA) 1994, Lyon (France) 1995, Hiroshima (Japan) 1997, Madras (India) 1999, Caen (France) 2000, Philadelphia (USA) 2001, Palermo (Italy) 2003, Auckland (New Zealand) 2004, Berlin (Germany) 2006, Buffalo (USA) 2008, Playa del Carmen (Mexico) 2009, and Madrid (Spain) 2011.

Combinatorial image analysis provides theoretical foundations and methods for solving problems from various areas of human practice. In contrast to traditional approaches to image analysis which implement continuous models, float arithmetic and rounding, combinatorial image analysis features discrete models using integer arithmetic. The developed algorithms are based on studying combinatorial properties of classes of digital images, and often appear to be more efficient and accurate than those based on continuous models.

IWCIA is an exciting opportunity for scholars, graduate students, and educators across the world to meet and share information about their latest findings in the field of combinatorial image analysis, be enriched with new ideas, reflect on some open problems, learn about new applications, and reconnect with colleagues. All papers submitted to the conference were carefully reviewed as each manuscript was sent for a double-blind review to at least three highly qualified members of the international Program Committee. The submission and review process of the workshop was carried out through the professional OpenConf conference management system. After a rigorous review process, 23 papers authored by 51 researchers from 11 countries were accepted for presentation at the workshop and for inclusion in this volume.

IWCIA 2012 featured keynote talks delivered by three outstanding scholars, whose excellent presentations inspired the audience with new ideas.

An opening talk given by János Pach (EPFL, Lausanne and Alfréd Rényi Institute of Mathematics, Budapest) was devoted to geometric graph theory. The latter studies geometric (topological) graphs that can be drawn in the plane by straight-line or curvilinear edges satisfying certain conditions. In his talk, the speaker discussed fundamental extremal questions in geometric graph theory and surveyed various results and unsolved problems.

David A. Eppstein (Donald Bren School of Information and Computer Sciences, University of California, Irvine) presented an approach based on three-dimensional hyperbolic geometry to forming a novel type of Voronoi diagram for circles in the plane. The proposed method provides a discrete combinatorial representation for a class of objects which may be applicable to visualization

of broader classes of low-degree planar graphs via “Lombardi drawings” with circular-arc edges.

Gerhard X. Ritter (University of Florida, Gainesville) presented a lattice algebra approach to computational intelligence and image processing. He provided an overview of lattice theory-based models and techniques in the field of computational intelligence and discussed the specific applications to hyperspectral image segmentation and pattern recognition.

The contributed papers included in the volume are grouped into two parts. The first one includes 11 papers devoted to diverse problems of digital geometry and topology, in particular studies on geometry and topology of digital curves and surfaces, the design of space-efficient algorithms, and others. The second part includes papers presenting array grammars and languages for image analysis, research on picture transformations, morphological operations, image segmentation, discrete tomography, and applications.

We believe that all presented works were of high quality and the attendees benefited from the scientific program.

We would like to express our gratitude to everyone who contributed to the success of IWCIA 2012 – from the Steering to the Program and Organizing Committees. We are indebted to our sponsors SUNY Buffalo State College and SUNY Fredonia, and in particular to the Interim Provost Kevin P. Kearns of SUNY Fredonia, who endorsed the publication of this volume.

We wish to express our special thanks to the invited speakers David A. Epstein, János Pach, and Gerhard X. Ritter for their remarkable talks and overall contribution to the workshop program. We thank all authors for their valuable works and hope that the reader will find them interesting and useful. We wish to thank the participants and everyone who made this workshop an enjoyable and fruitful scientific event. We had a great time at the Joe C. Thompson Conference Center of the University of Texas at Austin thanks to Elisabel Bordallo, Conference Services Manager, and Bailey Anne Dermanci; we appreciate their work. Finally, we express our gratitude to Springer’s Computer Science Editorial team, and especially to Alfred Hofmann and Anna Kramer, for their efficient and kind cooperation in the timely production of this book.

November 2012

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