IWCIA 2012
15th International Workshop on Combinatorial Image Analysis
University of Texas at Austin, Austin TX, USA
November 28-30, 2012

Wednesday, November 28th

08:00-8:45		Registration
08:45-10:00		Opening Session Chair: Valentin E. Brimkov
	08:45-09:00	Opening Addresses
	09:00-10:00	*Keynote:* János Pach, École Polytechnique Fédérale de Lausanne and Alfréd Rényi Institute of Mathematics, Budapest *Title:* Big Unsolved Problems in Geometric Graph Theory
10:00-10:30		Coffee Break & Picture
10:30-12:10		Digital Topology *Chair:* Peter Veelaert
	10:30-10:50	A New Framework for Connected Components Labeling of Binary Images *Tetsuo Asano, Sergey Bereg*
	10:50-11:10	Small Work Space Algorithms for Some Basic Problems on Binary Images *Tetsuo Asano, Sergey Bereg, Lilian Buzer*
	11:10-11:30	Adjacencies for Structuring the Digital Plane *Josef Šlapal*
	11:30-11:50	On Topology Preservation for Triangular Thinning Algorithms *Péter Kardos, Kálmán Palágyi*
	11:50-12:10	Cellular Topology on the Triangular Grid *Benedek Nagy*
12:10-13:30		Welcome Lunch
13:30-14:30		Afternoon Keynote Talk Chair: *Kálmán Palágyi*
	13:30-14:30	*Keynote:* David Eppstein, University of California, Irvine *Title:* Circle Packings, Hyperbolic Voronoi Diagrams, Lombardi Drawings, and Soap Bubbles
14:30-14:50		Coffee Break

14:50-16:50		Segmentation, Operations, and Transformations *Chair: Reneta Barneva*
	14:50-15:10	Binary Image Reconstruction from Two Projections and Skeletal Information *Norbert Hantos, Péter Balázs, Kálmán Palágyi*
	15:10-15:30	Energy-minimization Based Discrete Tomography Reconstruction Method for Images on Triangular Grid *Tibor Lukić, Benedek Nagy*
	15:30-15:50	Segmentation by a Local and Global Fuzzy Gaussian Distribution Energy Minimization of an Active Contour Model *Quang Tung Thieu, Marie Luong, Jean-Marie Rocchisani, Nikolay Metodiev Sirakov, Emmanuel Viennet*
	15:50-16:10	Incremental Learning of the Model for Watershed-Based Image Segmentation *Anja Attig, Petra Perner*
	16:10-16:30	Fast Level-Wise Convolution *Damien Gonzalez, Rémy Malgouyres, Henri-Alex Esbelin, Chafik Samir*
	16:30-16:50	Combinatorial Properties of 2D Discrete Rigid Transformations under Pixel-invariance Constraints *Phuc Ngo, Yukiko Kenmochi, Nicolas Passat, Hugues Talbot*
18:30-22:00		Banquet *Talk by Dr. Ahmed Tewfik, Chair,* *Department of Electrical and Computer Engineering* *Cockrell Family Regents Chair in Engineering #1*

Thursday, November 29th

08:30-9:00		Registration
9:00-10:00		Morning Keynote Talk *Chair: Josef Šlapal*
9:00-10:00		*Keynote:* Gerhard X. Ritter, University of Florida *Title:* Lattice Algebra Approach to Computational Intelligence and Image Processing
10:00-10:30		Coffee Break
10:30-12:30		Digital Geometry, Combinatorics in Digital Spaces *Chair: Petra Wiederhold*
	10:30-10:50	On Finding Shortest Isothetic Path inside a Digital Object *Mousumi Dutt, Arindam Biswas, Partha Bhowmick, Bhargab B. Bhattacharya*
	10:50-11:10	Fast Slicing of Orthogonal Covers Using DCEL *Nilanjana Karmakar, Arindam Biswas, Partha Bhowmick*
	11:10-11:30	Fast Combinatorial Algorithm for Tightly Separating Hyperplanes *Peter Veelaert*

	11:30-11:50	Digital Curvatures Applied to 3D Object Analysis and Recognition: A Case Study *Li Chen, Soma Biswas*
	11:50-12:10	Discrete Polynomial Curve Fitting to Noisy Data *Fumiki Sekiya, Akihiro Sugimoto*
	12:10-12:30	A Probabilistic Measure of Circularity *Ana M. Herrera-Navarro, Hugo Jiménez-Hernández, Iván R. Terol-Villalobos*
12:30-14:00		Lunch
14:00-16:00		Grammars and Models *Chair: Tetsuo Asano*
	14:00-14:20	A P System Model for Contextual Array Languages *K.G. Subramanian, Ibrahim Venkat, Petra Wiederhold*
	14:20-14:40	Rectangular Arrays and Petri Nets *D. Lalitha, K. Rangarajan, D.G. Thomas*
	14:40-15:00	Regional Hexagonal Tile Rewriting Grammars *T. Kamaraj, D.G. Thomas*
	15:00-15:20	Partial Commutation on Array Languages *T. Kamaraj, D.G. Thomas, H. Geetha, T. Kalyani*
	15:20-15:40	Novel Morphological Algorithms for Dominating Sets on Graphs with Applications to Image Analysis *Anupama Potluri,Chakravarthy Bhagvati*
	15:40-16:00	Skin Lesion Feature Vector Space with a Metric to Model Geometric Structures of Malignancy for Classification *Mutlu Mete, Ye-Lin Ou, Nikolay Metodiev Sirakov*
16:00-16:20		Closing

Friday, November 30, 2012

9:30-12:30	Social Program – Tour of Austin

Keynote Speakers

David A. Eppstein
Professor in the Computer Science Department, Donald Bren School of Information and Computer Sciences, University of California, Irvine
Wednesday, November 28, 2012, 13:30-14:30

Biosketch:
Dr. David A. Eppstein is a professor of computer science at the Donald Bren School of Information and Computer Sciences, University of California, Irvine. His research interests span a wide range of topics in graph algorithms and visualization, discrete and computational geometry, and theory of computing. Dr. Eppstein's is an author (together with Jean-Claude Falmagne and Sergei Ovchinnikov) of the monograph *Media Theory: Interdisciplinary Applied Mathematics (Springer)* and of nearly 400 publications in leading professional journals and conference proceedings, many of which have had a highest impact on the field. He has served as an editor or editorial board member of several top journals in his areas of expertise and as the conference program chair or co-chair for the ACM Symposium on Computational Geometry 2001, the ACM-SIAM Symposium on Discrete Algorithms 2002, and the International Symposium on Graph Drawing 2009. Dr. Eppstein is a recipient of a number of prestigious national or international awards. In 2011, he was named an ACM Fellow for his outstanding contributions to graph algorithms and computational geometry.

Abstract. We use three-dimensional hyperbolic geometry to form a novel type of Voronoi diagram for circles in the plane that is invariant under Möbius transformations. By combining this method with the Koebe-Thurston-Andreev circle packing theorem, we show that the graphs of planar soap bubble compounds are exactly the 2-connected 3-regular planar graphs; this result provides a discrete combinatorial representation for a class of objects that previously were studied only geometrically, and leads to efficient algorithms for constructing soap bubbles. Extensions of this method may be applied in visualizing broader classes of low-degree planar graphs via "Lombardi drawings" with circular-arc edges meeting at equal angles at each vertex.

János Pach
Professor at the École Polytechnique Fédérale de Lausanne and Alfréd Rényi Institute of Mathematics, Budapest
Wednesday, November 28,2012, 9:00-10:00

Biosketch:
Dr. Janos Pach is a distinguished professor of mathematics at CUNY, a research professor at the Courant Institute of Mathematics at NYU, a research fellow of the Alfréd Rényi Institute of Mathematics in the Hungarian Academy of Sciences, and a Professor of Mathematics at the École Polytechnique Fédérale de Lausanne. Dr. Pach's research is focused in the areas of discrete geometry and geometric graph theory. He has authored several books and over 200 research papers. He was one of the

most frequent collaborators of Paul Erdos authoring over 20 papers with him. Dr. Pach is a co-editor-in-chief of the journal *Discrete and Computational Geometry (Springer)* and an editorial board member of several other leading professional journals. He was the program chair for the International Symposium on Graph Drawing in 2004. Dr. Pach has received Grünwald Medal of the János Bolyai Mathematical Society, the Ford Award from the Mathematical Association of America, and the Alfréd Rényi Prize from the Hungarian Academy of Sciences. In 2011 he was named an ACM fellow for his outstanding research in computational geometry.

Abstract. In the problem session of the Jahresbericht der Deutschen Mathematiker-Vereinigung, in 1934, Hopf and Pannwitz posed the following problem: Prove that among $n \geq 3$ points in the plane, the largest distance (the diameter) can occur at most n times. This problem led to many new ones and has generated a lot of research in discrete geometry. What is the maximum number of edges, triangles, or higher-dimensional simplices in the diameter graph induced by n points in Euclidean d-space ($d \geq 3$)? At most how many times can the unit distance occur? A graph drawn in the plane by straight-line edges (curvilinear edges) is called a *geometric (topological) graph*. The fundamental extremal question in geometric graph theory is the following: What is the maximum number of edges that a geometric graph of n vertices can have if it does not contain a fixed, so-called "forbidden" configuration F? For example, what is the answer if F is a matching that consists of k disjoint edges, for a fixed integer k? The same question can be asked if F is a set of k pair-wise crossing edges. We survey some results and unsolved problems in this emerging discipline.

Gerhard X. Ritter
Professor in the Department of Computer and Information Science and Engineering, University of Florida
Thursday, November 29, 2012, 9:00-10:00

Biosketch:
Prof. Ritter received a Ph.D. in mathematics from the University of Wisconsin-Madison in 1971. He is a recipient of the Florida Blue Key Distinguished Faculty Award, which is given to faculty who excel in teaching, research and publication. He is a founding member and the first Chair of the Activity Group in Imaging Science of the Society of Industrial and Applied Mathematics. He served as editor-in-chief of the Journal of Mathematical Imaging and Vision, a chief editor of the Ibo-American journal Computacion y Sistemas, an area editor for the Journal of Electronic Imaging, and a member of the editorial board of several other journals. Dr. Ritter's research interests span the areas of artificial neural networks, applied mathematics, pattern recognition, image processing, and computer vision. As a principal investigator or co-PI, he received more than $14 million in research grants and contracts. He is a Fellow of the International Society for Optical Engineering and is a member of the European Academy of Sciences and the New York Academy of Science. He received the International Federation for Information Processing Silver Core Award and, together with Joseph Wilson, won the General Ronald W. Yates Award for Excellence in Technology Transfer from the Air Force Research Laboratory in 1998. He was the recipient of the University of Florida Research Achievement Award for 1990-1993, and has authored or co-authored 2 books and more than 125 referred articles.

Abstract. Lattice theory is not part of current mainstream image processing and computational intelligence techniques. However, a sizable number of researchers are currently active in developing lattice theory based models and techniques in the field of computational intelligence with applications in image processing and pattern recognition. This talk provides a brief overview of some of these activities and the rationale for the use of lattice based computation. Specific applications will focus on hyperspectral image segmentation and pattern recognition. The talk will conclude with a few open problems in lattice algebra.