

*Commenced Publication in 1973*

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

## Editorial Board

David Hutchison

*Lancaster University, UK*

Takeo Kanade

*Carnegie Mellon University, Pittsburgh, PA, USA*

Josef Kittler

*University of Surrey, Guildford, UK*

Jon M. Kleinberg

*Cornell University, Ithaca, NY, USA*

Alfred Kobsa

*University of California, Irvine, CA, USA*

Friedemann Mattern

*ETH Zurich, Switzerland*

John C. Mitchell

*Stanford University, CA, USA*

Moni Naor

*Weizmann Institute of Science, Rehovot, Israel*

Oscar Nierstrasz

*University of Bern, Switzerland*

C. Pandu Rangan

*Indian Institute of Technology, Madras, India*

Bernhard Steffen

*University of Dortmund, Germany*

Madhu Sudan

*Massachusetts Institute of Technology, MA, USA*

Demetri Terzopoulos

*University of California, Los Angeles, CA, USA*

Doug Tygar

*University of California, Berkeley, CA, USA*

Gerhard Weikum

*Max-Planck Institute of Computer Science, Saarbruecken, Germany*

Hiro Ito Mikio Kano Naoki Katoh  
Yushi Uno (Eds.)

# Computational Geometry and Graph Theory

International Conference, KyotoCGGT 2007  
Kyoto, Japan, June 11-15, 2007  
Revised Selected Papers

## Volume Editors

Hiro Ito  
Kyoto University, School of Informatics  
Yosida-Honmachi, Kyoto 606-8501, Japan  
E-mail: itohiro@kuis.kyoto-u.ac.jp

Mikio Kano  
Ibaraki University  
Department of Computer and Information Sciences Hitachi  
Ibaraki 316-8511, Japan  
E-mail: kano@mx.ibaraki.ac.jp

Naoki Katoh  
Kyoto University  
Department of Architecture and Architectural Engineering  
Nishikyo-ku, Kyoto, 615-8540, Japan  
E-mail: naoki@archi.kyoto-u.ac.jp

Yushi Uno  
Osaka Prefecture University, Graduate School of Science  
Department of Mathematics and Information Sciences  
Sakai 599-8531, Japan  
E-mail: uno@mi.s.osakafu-u.ac.jp

Library of Congress Control Number: 2008939366

CR Subject Classification (1998): I.3.5, G.2, F.2.2, E.1

LNCS Sublibrary: SL 6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

ISSN 0302-9743  
ISBN-10 3-540-89549-3 Springer Berlin Heidelberg New York  
ISBN-13 978-3-540-89549-7 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media

springer.com

© Springer-Verlag Berlin Heidelberg 2008  
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India  
Printed on acid-free paper SPIN: 12537730 06/3180 5 4 3 2 1 0



**Jin Akiyama (right) and Vašek Chvátal (left)  
at the conference Banquet celebrating their 60th birthdays**

# Preface

This volume consists of the refereed proceedings of the Kyoto Conference on Computational Geometry and Graph Theory (KyotoCGGT 2007), held at Kyoto University in Kyoto, Japan, 11–15 June 2007, to honor Jin Akiyama and Vašek Chvátal on their 60th birthdays. More than 200 participants from 20 countries attended the conference.

Akiyama and Chvátal have been good friends since they met in Tokyo in 1979. Akiyama started the conference series Japan Conference on Discrete and Computational Geometry (JCDCG) in 1997, which has been held annually since that time. In 2001, the conference venue began to alternate between Tokyo and selected Asian cities to attract and encourage Asian graph theorists and geometers. Chvátal, on the other hand, is world-renowned for his contributions to discrete mathematics.

Since it was first organized in 1997, the annual JCDCG conference has attracted a growing international participation. Earlier conferences were held in Tokyo, followed by conferences in Manila, Philippines (2001), Bandung, Indonesia (2003), and Tianjin and Xi'an, China (2005). The proceedings of JCDCG 1998, 2000, 2002, 2004, IJCCGGT 2003 and CJCDGCGT 2005 were published by Springer in the series *Lecture Notes in Computer Science* (LNCS) as volumes 1763, 2098, 2866, 3742, 3330 and 4381, respectively, while the proceedings of JCDCG 2001 were also published by Springer as a special issue of the journal *Graphs and Combinatorics*, Vol. 18, No. 4, 2002.

The organizers of KyotoCGGT 2007 gratefully acknowledge the support of the sponsors, the work of the conference secretariat and the participation of the principal speakers : William Cook, Greg Frederickson, Ferran Hurtado, Joseph O'Rourke, János Pach, Bruce Reed, Akira Saito, Kokichi Sugihara, Godfried Toussaint and Jorge Urrutia.

June 2008

Hiro Ito  
Mikio Kano  
Naoki Katoh  
Yushi Uno

# Organization

## **The Organizing Committee**

### **Conference Chair**

Naoki Katoh

### **Program Committee Chairs**

David Avis and Mikio Kano

### **Program Committee**

Naoki Katoh, Haruhide Matsuda, Yushi Uno and Masatsugu Urabe

### **Organizing Committee Chair**

Hiro Ito

### **Organizing Committee**

Takashi Horiyama, Yoshiyuki Karuno, Haruhide Matsuda, Shuichi Miyazaki, Toshinori Sakai, Suguru Tamaki, Xuehou Tan, Yushi Uno, Masatsugu Urabe, Liang Zhao

## **Sponsors**

Scientific Research on Priority Areas; New Horizons in Computing

(Leader: Kazuo Iwama)

Kyoto University

The Kyoto University Foundation

Tokai University

Osamu Miyamoto Foundation of Ibaraki University

Surugadai Gakuen

# Table of Contents

Dudenev Transformation of Normal Tiles . . . . .	1
<i>Jin Akiyama, Midori Kobayashi, and Gisaku Nakamura</i>	
Chromatic Numbers of Specified Isohedral Tilings . . . . .	14
<i>Jin Akiyama and Chie Nara</i>	
Transforming Graphs with the Same Degree Sequence . . . . .	25
<i>Sergey Bereg and Hiro Ito</i>	
The Forest Number of $(n, m)$ -Graphs . . . . .	33
<i>Avapa Chantasartrassmee and Narong Punnim</i>	
Computing Simple Paths on Points in Simple Polygons . . . . .	41
<i>Ovidiu Daescu and Jun Luo</i>	
Deflating the Pentagon . . . . .	56
<i>Erik D. Demaine, Martin L. Demaine, Thomas Fevens, Antonio Mesa, Michael Soss, Diane L. Souvaine, Perouz Taslakian, and Godfried Toussaint</i>	
Enumeration of Polyominoes, Polyiamonds and Polyhexes for Isohedral Tilings with Rotational Symmetry . . . . .	68
<i>Hiroshi Fukuda, Nobuaki Mutoh, Gisaku Nakamura, and Doris Schattschneider</i>	
Solvable Trees . . . . .	79
<i>Severino V. Gervacio, Yvette F. Lim, and Leonor A. Ruivivar</i>	
Ramsey Numbers on a Union of Identical Stars Versus a Small Cycle . . .	85
<i>Hasmawati, H. Assiyatun, E.T. Baskoro, and A.N.M. Salman</i>	
A Minimal Planar Point Set with Specified Disjoint Empty Convex Subsets . . . . .	90
<i>Kiyoshi Hosono and Masatsugu Urabe</i>	
Fast Skew Partition Recognition . . . . .	101
<i>William S. Kennedy and Bruce Reed</i>	
Some Results on Fractional Graph Theory . . . . .	108
<i>Guizhen Liu</i>	
Seven Types of Random Spherical Triangle in $\mathbf{S}^n$ and Their Probabilities . . . . .	119
<i>Yoichi Maeda</i>	

(3,2)-Track Layout of Bipartite Graph Subdivisions . . . . .	127
<i>Miki Miyauchi</i>	
Bartholdi Zeta Functions of Branched Coverings of Digraphs . . . . .	132
<i>Hirobumi Mizuno and Iwao Sato</i>	
On Super Edge-Magic Strength and Deficiency of Graphs . . . . .	144
<i>A.A.G. Ngurah, E.T. Baskoro, R. Simanjuntak, and S. Uttungadewa</i>	
The Number of Flips Required to Obtain Non-crossing Convex Cycles . . . . .	155
<i>Yoshiaki Oda and Mamoru Watanabe</i>	
Divide and Conquer Method for $k$ -Set Polygons . . . . .	166
<i>Wael El Oraiby and Dominique Schmitt</i>	
Coloring Axis-Parallel Rectangles . . . . .	178
<i>János Pach and Gábor Tardos</i>	
Domination in Cubic Graphs of Large Girth . . . . .	186
<i>Dieter Rautenbach and Bruce Reed</i>	
Chvátal–Erdős Theorem: Old Theorem with New Aspects . . . . .	191
<i>Akira Saito</i>	
Computer-Aided Creation of Impossible Objects and Impossible Motions . . . . .	201
<i>Kokichi Sugihara</i>	
The Hamiltonian Number of Cubic Graphs . . . . .	213
<i>Sermsri Thaithae and Narong Punnim</i>	
SUDOKU Colorings of the Hexagonal Bipyramid Fractal . . . . .	224
<i>Hideki Tsuiki</i>	
<b>Author Index</b> . . . . .	237