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Graph Drawing

22nd International Symposium, GD 2014
Würzburg, Germany, September 24-26, 2014
Revised Selected Papers



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Preface

This volume contains the papers that were presented at the 22nd International Symposium on Graph Drawing, which was held during September 24-26, 2014, in Würzburg, Germany. The symposium was hosted by the University of Würzburg and was attended by 106 participants from 16 countries. Fourteen of the participants were from industry. We thank Alexander Wolff, the local arrangements chair, and his team (Krzysztof Fleszar, Philipp Kindermann, Joachim Spoerhase, Mrs. Sigrid Keller, Fabian Lipp, Ben Morgan, and Wadim Reimche) for their warm hospitality.

Paper submissions were partitioned into two tracks with a separate poster track. Track 1 dealt with combinatorial and algorithmic aspects; track 2 with experimental, applied, and network visualization aspects. In total there were 84 submissions: 72 papers and 12 posters (each poster included a two-page description). Each submission was reviewed by at least three Program Committee members. The Program Committee decided to accept 41 papers and 11 posters. The acceptance rates were 33/52 in track 1, 8/20 in track 2, and 11/12 for posters.

We thank the Program Committee members and the additional reviewers for carefully reviewing the submitted papers and posters and for putting together a strong and interesting program. We also thank all authors for their hard work and for choosing GD 2014 as the publication venue for their research.

GD 2014 had two invited talks. Oswin Aichholzer from the University of Graz, Austria, gave a talk entitled “Good Drawings and Rotation Systems of Complete Graphs.” Jean-Daniel Fekete from Inria, France, introduced the audience to the benefits of “Matrix-Based Visualization of Graphs.” We thank both speakers for their excellent talks, which were very well received by the GD 2014 audience.

GD 2014 awarded prizes for Best Presentation and Best Poster. Most of the conference participants stayed until the last talk and voted for the winners. The Best Presentation award was split between two presenters: Vincent Kusters from ETH Zürich for his talk on the paper “Column Planarity and Partial Simultaneous Geometric Embedding,” and Fidel Barrera-Cruz from the University of Waterloo for his talk on the paper “Morphing Schnyder Drawings of Planar Triangulations.” The Best Poster award was won by Thomas Bläsius, Fabian Klute, Benjamin Niedermann and Martin Nöllenburg for their poster entitled “PIGRA — A Tool for Pixelated Graph Representations.”

Following the community’s well established tradition, the 21st Annual Graph Drawing Contest was held during the conference. It had two main categories: an off-line contest and an on-line challenge. This year’s Contest Committee was chaired by Carsten Gutwenger (University of Dortmund). We thank the committee for preparing challenging problems and problem instances. A report of the contest is included in these proceedings.

We also wish to thank our sponsors: “diamond” sponsor German Research Foundation (DFG), “gold” sponsor Tom Sawyer Software, “silver” sponsors Microsoft and yWorks, and “bronze” sponsor Vis4. Their gracious support helps ensure the continued success of this conference.

In order to better reflect the diverse interests of the symposium both in theoretical aspects and in applications and systems design, the name of GD in 2015 will be extended to “International Symposium on Graph Drawing and Network Visualization.” The 23rd International Symposium on Graph Drawing and Network Visualization will be held in Los Angeles, USA, during September 23-25, 2015. Emilio Di Giacomo and Anna Lubiw will be the Program Committee chairs. Csaba Tóth will be the Organizing Committee chair.

September 2014

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Invited Talks

Good Drawings and Rotation Systems of Complete Graphs

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Abstract. In a good drawing of a complete graph the vertices are drawn as distinct points in the plane, edges are drawn as non-self-intersecting continuous arcs connecting its two end points, but not passing through any other point representing a vertex. Moreover, any pair of edges intersects at most once, either in their interior or at a common endpoint, no tangencies are allowed and no three edges pass through a single crossing. These drawings are also called simple topological graphs.

A rotation system (of a good drawing of a complete graph) gives, for each vertex v of the graph, the circular ordering around v of all edges incident to v . In combinatorial mathematics, rotation systems were first used by Hefner in 1891 to encode embeddings of graphs onto orientable surfaces, determining its genus. In the plane (or equivalently on the sphere) the rotation system of a good drawing does not fully determine the drawing, but contains combinatorial information like all pairs of edges which intersect.

We present basic properties of these two concepts, as well as recent progress. This includes results on the number of realizable rotation systems, the crossing number of complete graphs (including the recent concept of shellability of a good drawing), relations to other systems like the order type of a point set, etc.

Matrix-Based Visualization of Graphs

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Abstract. For decades, graph drawing has focused on the node-link representation, trying to address multiple important, difficult, and interesting issues related to 2D embeddings under some optimality criteria (planar drawing, minimizing crossings, optimizations, graph decompositions, and many more). Visualizing a graph structure using its adjacency matrix is much less common, although it has been shown to be more efficient than the node-link representation when the graph becomes dense, for important low-level tasks. The main question to address in matrix-based visualization is the computation of the vertices order. This problem is known with multiple names: linear ordering, seriation, re-ordering. With a proper ordering, a visualized matrix reveals important patterns and structures of the graph. We will briefly explain how the problem has been formalized in the past, some visual results sometimes revealing unexpected information. We then list some challenges to the community that could be used to motivate the graph drawing community to study the problem, and provide useful solutions for people who need to make sense of complex graphs.

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