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Graph Drawing and Representations

Special Issue on Selected Papers from the Seventh International Symposium on Graph Drawing, GD'99

Guest Editors' Foreword

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1 A few words about the conference

This special issues features contributions based on five of the papers and one of the invited talks presented at GD'99 at Stirin Castle in the vicinity of Prague, Czech Republic. The conference brought together researchers, practitioners, developers and users working on all aspects of graph visualization and representations. The issues considered in graph drawing range from geometry, topology, partially ordered sets and graph theory, through algorithms and complexity theory to practical systems and applications. The interaction between theoretical advances and implemented solutions has always been an important part of the graph drawing field and of the Graph Drawing Symposia.

In a recently restored baroque castle 30 km out of Prague, the participants were less distracted by the numerous opportunities of day- and night-life attractions of the fabulous city. The English style gardens of the castle provided opportunities for walks and discussions, the artistic atmosphere of the castle was enhanced by the conference concert given by Jiří Stivín, a prominent Czech jazz musician, and by the invited talk “Art of drawing” by Jaroslav Nešetřil, who is also a prominent Prague painter. It is our pleasure to include a paper based on this talk in our volume.

In total 38 papers were accepted and presented during the conference. Five of these papers were invited for this special volume. All of them went through further rigorous refereeing process. Also because of this, but from other reasons as well, the papers in this volume differ substantially from their proceedings versions. Most of them are presented in more detail, and therefore became significantly longer. In one case, on the other hand, the new version became considerably shorter than the conference one. This is because a stronger and more general theorem was proven by the author in the meantime. We believe that both publishing new stronger results as well as including more details to other papers' results and proofs will be welcome and appreciated and justifies the 2 year span between the conference and the appearance of this special volume. We would like to thank the authors for their patience and the referees for their hard work.

2 A few words about the papers

The first and last papers of the volume are devoted to geometrical representations of graphs or partially ordered sets. The question if every planar graph allows a representation as an intersection graph of straight line segments has now become a well known problem in the area, with names as Fellows, Pach, Pollack, Scheinerman and Erdős attached to various partial results and variants of the problem. It is well known that planar bipartite graphs are even contact graphs of segments. The result stating that planar triangle-free graphs are intersection graphs of segments in three directions in the plane proved in *Triangle-free planar graphs and segment intersection graphs* by de Castro, Cobos, Dana, Marquez and Noy is still today, 2 years after the GD'99 conference,

the strongest result in the area.

The paper *Planar Graphs with Topological Constraints* by Dornheim considers the question of drawing graphs under certain topological constraints, namely of the form that a vertex is inside or outside a particular cycle in the graph. This novel approach is treated very thoroughly and a number of NP-completeness results and polynomial time algorithms are presented.

Jünger and Leipert in their paper *Level Planar Embedding in Linear Time* provide a second step towards automatic drawing of level planar graphs. At GD'98, Jünger, Leipert and Mutzel presented a linear time algorithm for recognizing level planar graphs. The step from recognition to actual construction of an embedding, which is definitely not straightforwardly linear time, is presented in this paper.

Drawing planar graphs on a prescribed locations of vertices is an important question, both from theoretical and practical points of view. The paper *Embedding Vertices at Points: Few Bends suffice for Planar Graphs* by Kaufmann and Wiese show (among other results) that every 4-connected planar graph can be embedded on any given point set with at most one bend per edge, while this question is NP-complete for general planar graphs.

The invited talk of Jarik Nešetřil about “Art of drawing” was very well accepted by the participants of GD'99. It is true that the speaker talked slightly more about art and drawings than about graphs, but the audience learned a lot from this talk about the meaning and significance of drawings. After the recent development in the area, namely the talk of the author at the symposium Graph Drawing 2001 in Vienna (coauthored by J. Adamec), we have asked Nešetřil to prepare a paper stemming from his earlier presentation which would, however, reflect and comment on the new notion of *fractal length* or *combinatorial entropy* of drawings. We appreciate very much that he was willing to prepare this contribution in such a short time, so that it is possible to include it in the present volume.

The last paper of the volume, *Realization of Posets* by Ossona de Mendez is another paper on geometric representations. It presents a very general result on representations of partially ordered sets which, among others, generalizes a famous result of Schnyder about incidence posets of planar graphs.