

Guest Editors' Foreword

The current special issue is the indirect result of the **Fifth Workshop on Graph Classes, Optimization, and Width Parameters, GROW 2011**, held in Daejeon, South Korea, in October 2011. It is a successor to the following special issues of *Discrete Applied Mathematics*: 160-6 (2012) dedicated to GROW 2009, held in Bergen, Norway; 158-7 (2010) dedicated to GROW 2007, held in Eugene, Oregon; 157-12 (2009) dedicated to the second workshop in the series, held in 2005 in Prague, Czech Republic; 145-2 (2005) dedicated to the first workshop, held in 2001 in Barcelona, Spain; and 54-2/3 (1994) dedicated to a workshop held in 1989 in Eugene, which in retrospect we view as workshop number zero in what has evolved to become the successful bi-annual GROW workshop series.

This issue comprises 12 papers authored mainly, but not exclusively, by participants of the workshop. All submissions have been carefully refereed and we thank all the referees for their hard work. True to the name of the workshop, the papers in the current special issue report on investigations in three areas of research: **Graph classes**, **Optimization**, and **Width parameters**. Due to the close interconnections among these areas, most of the papers fit into more than one of these areas. Based on their main focus, we introduce the papers in this issue in the corresponding three groups.

The area of **Graph Classes** is represented by papers proving new structural properties of various graph classes and exploring algorithmic consequences of these properties. *Adler, Farley, and Proskurowski* establish the set of minimal forbidden induced subgraphs for the class of graphs whose linear rank-width is at most 1. From these they derive both the vertex-minor and the pivot-minor obstructions for the class. *Chaplick and Stacho* introduce a new graph parameter, which they call vertex leafage, and they study this parameter on chordal graphs. In particular, they prove that every chordal graph admits a tree model that realizes both its leafage and its vertex leafage, and they study the computational complexity of computing the vertex leafage of chordal graphs. *Le* gives new characterizations for co-bipartite opposition graphs, co-bipartite coalition graphs, and bipartite opposition graphs. Linear time recognition algorithms for these graph classes follow from the new characterizations. *Nestoridis and Thilikos* show that for every non-trivial and minor closed graph class, all graphs in its square root have carving-width bounded by some constant depending only on the graph class. As a consequence, every square root of such a graph class has a linear time recognition algorithm.

The **Optimization** section consists of papers that study computational complexity and algorithmic issues of various optimization problems on graphs. *Chalopin and Paulusma* consider the problem of packing a given graph with as many graphs as possible from a given set. They settle the complexity of determining whether a given bipartite graph can be perfectly packed with covers of complete bipartite graphs of a given size. *Krause* studies the register allocation problem, and he shows that this problem is W[SAT]-hard when parameterized by the number of registers. *Liedloff, Todinca, and Villanger* study the problem of computing a capacitated dominating set of minimum cardinality. By combining elements from existing methods for this problem via maximum matchings and covering by subsets, they give a faster algorithm for the problem on general graphs. *Otachi, Saitoh, Yamanaka, Kijima, Okamoto, Ono, Uno, and Yamazaki* add new results on the complexity of computing path-distance-width. They show that the problem remains NP-complete on AT-free graphs, and they present a fast approximation algorithm for the problem on this graph class.

The section on **Width Parameters** contains papers that give new insights about width parameters of graphs. Inspired by Kelly-width, *Fernau and Meister* introduce the elimination-width parameter for digraphs, which generalizes Kelly-width. They also provide a game characterization of elimination-width. *Ganian, Hliněný, Kneis, Langer, Obdržálek, and Rossmanith* consider a range of problems on digraphs, and they perform a systematic study of their complexity with respect to various digraph width parameters. *Kwon and Oum* show that every graph of rank-width k is a pivot-minor of a graph of tree-width at most $2k$. In addition they study arbitrary and bipartite graphs of rank-width and linear rank-width 1, and they characterize these in terms of classes of graphs of which they are pivot-minors and vertex-minors. Finally *Perarnau and Serra* study the tree-depth parameter on random graphs. For various values p , they compute asymptotic values of the tree-depth of a random graph in which each edge appears independently with probability p .

The topics discussed in this issue represent an active and vibrant research area of contemporary graph theory. As the issue was being completed, in October 2013, the Sixth Workshop on Graph Classes, Optimization, and Width Parameters, GROW 2013, was held in Santorini, Greece.

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The participants of GROW 2011 at KAIST

Guest Editors
Pinar Heggernes¹
Jan Kratochvíl
Sang-il Oum

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¹Corresponding editor