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Editorial

Foreword: Eighth Workshop on Graph Classes, Optimization, and Width Parameters, Toronto, Ontario, Canada

Foreword

The current special issue is the indirect result of the Eighth Workshop on Graph Classes, Optimization, and Width Parameters, GROW, held in Toronto, Ontario in October 2017. It is a successor to the following special issues of *Discrete Applied Mathematics*: Volume 248, 1–2 (2018), dedicated to GROW 2015 held in Aussois, France; Volume 199 (2016), dedicated to GROW 2013 held in Santorini, Greece; Volume 168 (2014) dedicated to GROW 2011, held in Daejeon, South Korea; Volume 160, 6 (2012) dedicated to GROW 2009, held in Bergen, Norway; Volume 158, 7 (2010) dedicated to GROW 2007, held in Eugene, Oregon; Volume 157, 12 (2009) dedicated to the second workshop in the series, held in 2005 in Prague, Czech Republic; Volume 145, 2 (2005) dedicated to the first workshop, held in 2001 in Barcelona, Spain; and Volume 54, 2–3 (1994) dedicated to a workshop held in 1989 in Eugene, Oregon, that in retrospect we view as the original workshop in what has evolved to become the successful biennial GROW workshop series.

This issue comprises 11 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 linkage among these areas, most of the papers fit into more than one of them. Based on their main focus, we introduce the papers in this issue in the corresponding three groups.

Graph classes

Golovach, Heggernes, Kratsch, and Saei study the enumeration of all minimal connected dominating sets of an input chordal graph. They exhibit an enumeration algorithm running in time $O(1.4736^n)$ and use it to show that every n-vertex chordal graph has at most 1.4736^n minimal connected dominating sets.

A protrusion in a graph is a subgraph of constant treewidth that can be separated from the graph by removing a constant number of vertices. For several graph problems, for every boundary size t one can find an explicit set R_t of representatives. Jansen and Wulms use a protusion replacement technique to obtain lower bounds on the sizes of representative graphs.

Protusion decomposability is also one of the tools used by Chatzidimitriou, Thilikos, and Zoros. They consider the graphs reducible (by removing a fixed number k of vertices) to graphs without a given class H of obstructions (topological minor-free from members of H). They investigate bounds on the size of the graphs in such classes of sparse graphs that additionally do not contain a fixed graph F as a topological minor.

In fair deletion problems, the goal is to find a subset of edges such that after its removal the graph satisfies the given graph property (defined by a first-order or monadic second-order expression) while the maximum number of deletions in a neighborhood of a single vertex is minimized. Masařík and Toufar study complexity of fair deletion problems parametrized by treewidth, pathwidth, treedepth, size of a minimum feedback vertex set, neighborhood diversity, and the size of minimum vertex cover.

Optimization

Bessy, Bougeret, Chaplick, Gonçalves, and Paul consider classes on intersection graphs of simple paths with at most k bends on a rectangular grid (B_k-EPG). In their exploration of the complexity of the Maximum Independent Set problem (MIS) on B_1-EPG graphs they show that there is no PTAS for MIS on B_1-EPG unless P = NP. They also investigate the complexity of PTAS for restricted shapes of paths in B_1-EPG and B_2-EPG problems.

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Le and Pfender introduce the notion of color-line graphs (generalizing the classical concept of line graphs) and give Krausz-type characterizations for (proper) color-line graphs. They also show that, for any fixed k, recognizing color-line graphs of properly edge colored graphs with at most k colors is polynomially solvable. Additionally, they investigate the complexity of recognizing whether a graph is the color-line graph of some graph H in which the edges are colored with at most $k \geq 2$ colors.

Brandstädt and Mosca discuss the complexity of the (NP-hard in general) Dominating Induced Matching problems when restricted to $S_{i,j,k}$-free graphs for fixed i, j, k. They show an efficient solution algorithm for the problem restricted to the class of $S_{1,2,4}$-free graphs.

Width parameters

Grammatical and logical treatments of cliquewidth are the subjects of two papers by Courcelle. In the first, he extends the seminal ideas of split decompositions to vertex substitution, graph grammars and clique-width to obtain a simple grammar for distance-hereditary graphs. Additionally, he extends these results to directed graphs and their split decompositions.

In the second paper, Courcelle considers graphs that can be drawn in the plane with limited edge crossings. He shows that tree-width and clique-width are linearly related for graphs drawable with a graph of crossings of bounded average degree.

Tree-decomposition of control-flow graphs for programs written in C is considered in the paper by Krause, Larisch, and Salfelder. It shows the effect of the **goto** statement on treewidth of programs and indicates how to reduce compiling time of such programs.

Jaffke, Kwon, and Telle initiate a series of papers dealing with algorithmic properties of the maximum induced matching- (mim-)width parameter. In this paper they provide the first polynomial-time algorithms on graphs of bounded mim-width for several problems that are not locally checkable.

Conclusion

The topics discussed in this issue represent an active and vibrant research area of contemporary graph theory. The Ninth Workshop on Graph Classes, Optimization, and Width Parameters, GROW 2019, was held in September 2019 at the Vienna University of Technology (TU Wien). Keeping with tradition of previous workshops in the series, its by-product will be a special issue of *Discrete Applied Mathematics*. The guest editors of the GROW 2019 special issue are Robert Ganian, Jan Kratochvíl, and Stefan Szeider. The bidecennial workshop, GROW 2021, is scheduled to take place in the Fall of 2021 at the University of Primorska in Koper, Slovenia.

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