ON GRAPHS REPRESENTABLE BY PATTERN-AVOIDING WORDS

Yelena Mandelshtam

Stanford University, Stanford, CA, USA

e-mail: yelena13@stanford.edu

Abstract

In this paper we study graphs defined by pattern-avoiding words. Word-representable graphs have been studied extensively following their introduction in 2004 and are the subject of a book published by Kitaev and Lozin in 2015. Recently there has been interest in studying graphs represented by pattern-avoiding words. In particular, in 2016, Gao, Kitaev, and Zhang investigated 132-representable graphs, that is, word-representable graphs that can be represented by a word which avoids the pattern 132. They proved that all 132-representable graphs are circle graphs and provided examples and properties of 132-representable graphs. They posed several questions, some of which we answer in this paper.

One of our main results is that not all circle graphs are 132-representable, thus proving that 132-representable graphs are a proper subset of circle graphs, a question that was left open in the paper by Gao *et al.* We show that 123-representable graphs are also a proper subset of circle graphs, and are different from 132-representable graphs. We also study graphs represented by pattern-avoiding 2-uniform words, that is, words in which every letter appears exactly twice.

Keywords: pattern-avoidance, word-representability, circle graphs.

2010 Mathematics Subject Classification: 05C99.

References

[1] A.L.L. Gao, S. Kitaev and P.B. Zhang, *On 132-representable graphs*, Australas. J. Combin. **69** (2017) 105–118.

[2] M.M. Halldórsson, S. Kitaev and A. Pyatkin, *Semi-transitive orientations and word-representable graphs*, Discrete Appl. Math. **201** (2016) 164–171.
doi:10.1016/j.dam.2015.07.033

[3] S. Kitaev and A. Pyatkin, *On representable graphs*, J. Autom. Lang. Comb. **13** (2008) 45–54.

[4] S. Heubach and T. Mansour, Combinatorics of Compositions and Words (CRC Press, 2009).
doi:10.1201/9781420072686

[5] S. Kitaev, Patterns in Permutations and Words (Springer Science & Business Media, 2011).
doi:10.1007/978-3-642-17333-2

[6] S. Kitaev and V. Lozin, Words and Graphs (Springer, NY, 2015).
doi:10.1007/978-3-319-25859-1