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A linear-time kernelization for the rooted k-leaf outbranching problem. (English)

Zbl 1317.05072
Discrete Appl. Math. 193, 126-138 (2015).

Summary: In the rooted k-leaf outbranching problem, a digraph $G = (V, E)$, a vertex r of G, and an integer k are given, and the goal is to find an r-rooted spanning outtree of G with $\geq k$ leaves (a subtree of G with vertex set V, all edges directed away from r, and $\geq k$ leaves). We present a linear-time algorithm that computes a problem kernel with $O(k^6)$ vertices and $O(k^7)$ edges for the rooted k-leaf outbranching problem. By combining the new result with a result of *J. Daligault* and *S. Thomassé* [Lect. Notes Comput. Sci. 5917, 86–97 (2009; Zbl 1273.68162)], a kernel with a quadratic number of vertices and edges can be found on n-vertex m-edge digraphs in time $O(n + m + k^{14})$.

MSC:

05C20 Directed graphs (digraphs), tournaments
05C05 Trees
05C69 Vertex subsets with special properties (dominating sets, independent sets, cliques, etc.)
68Q25 Analysis of algorithms and problem complexity

Keywords:

parameterized complexity; linear-time data reduction; NP-hard graph problems; dominator trees

Full Text: DOI

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