A Polynomial Kernel for Paw-Free Editing

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Abstract

For a fixed graph H, the H-free-Edge Editing problem asks whether we can modify a given graph G by adding or deleting at most k edges such that the resulting graph does not contain H as an induced subgraph. The problem is known to be NP-complete for all fixed H with at least 3 vertices and it admits a $2^{\mathcal{O}(k)}n^{\mathcal{O}(1)}$ algorithm. Cai and Cai [Algorithmica (2015) 71:731–757] showed that H-free-Edge Editing does not admit a polynomial kernel whenever H or its complement is a path or a cycle with at least 4 edges or a 3-connected graph with at least 1 edge missing. Their results suggest that if H is not independent set or a clique, then H-free-Edge Editing admits polynomial kernels only for few small graphs H, unless $\mathsf{coNP} \in \mathsf{NP/poly}$. Therefore, resolving the kernelization of H-free-Edge Editing for small graphs H plays a crucial role in obtaining a complete dichotomy for this problem. In this paper, we positively answer the question of compressibility for one of the last two unresolved graphs H on 4 vertices. Namely, we give the first polynomial kernel for Paw-free-Edge Editing with $\mathcal{O}\left(k^6\right)$ vertices.

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