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Improved approximation algorithms for hitting 3-vertex paths. (English) Zbl 1442.05222

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Summary: We study the problem of deleting a minimum cost set of vertices from a given vertex-weighted graph in such a way that the resulting graph has no induced path on three vertices. This problem is often called cluster vertex deletion in the literature and admits a straightforward 3-approximation algorithm since it is a special case of the vertex cover problem on a 3-uniform hypergraph. Recently, *J. You* et al. [Discrete Appl. Math. 219, 202–209 (2017; [Zbl 1354.05110](#))] described an efficient $5/2$ -approximation algorithm for the unweighted version of the problem. Our main result is a $9/4$ -approximation algorithm for arbitrary weights, using the local ratio technique. We further conjecture that the problem admits a 2-approximation algorithm and give some support for the conjecture. This is in sharp contrast with the fact that the similar problem of deleting vertices to eliminate all triangles in a graph is known to be UGC-hard to approximate to within a ratio better than 3, as proved by *V. Guruswami* and *E. Lee* [SIAM J. Discrete Math. 31, No. 3, 1552–1571 (2017; [Zbl 1371.68099](#))].

MSC:

[05C85](#) Graph algorithms (graph-theoretic aspects)
[90C27](#) Combinatorial optimization
[90C59](#) Approximation methods and heuristics in mathematical programming
[68W25](#) Approximation algorithms

Cited in 1 Document

Keywords:

[cluster vertex deletion](#)

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