

On the Parameterized Complexity of Finding Paths with Shared Edges

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Abstract:

We study the Minimum Shared Edges (MSE) problem on undirected graphs. Given an undirected graph, a source and a sink vertex, and two integers p and k , the question is whether there are p paths in the graph connecting the source with the sink that share at most k edges. Herein, an edge is shared if it appears in at least two paths. Complementing an NP-hardness result for the directed variant, we show that MSE is NP-complete even on planar graphs. Further, we show that MSE is W[2]-hard when parameterized by the number k of shared edges and W[1]-hard when parameterized by the treewidth. On the positive side, we show that MSE is fixed-parameter tractable with respect to the number p of paths. For the latter result, we employ the so-called treewidth reduction technique due to Marx, O’Sullivan and Razgon [1].

The talk is based on a joint work with Stefan Kratsch, Rolf Niedermeier and Manuel Sorge.

References

- [1] D. Marx, B. O’Sullivan, and I. Razgon. Finding small separators in linear time via treewidth reduction. *ACM Transactions on Algorithms*, 9(4):30, 2013.