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Editorial Office
Electronic Journal of Graph Theory and Applications

Date
Dec. 16, 2020

Submission to Electronic Journal of Graph Theory and Applications

Dear Editor,

please find attached the paper "Simultaneously Dominating all Spanning Trees of a Graph" written by Prof. Dr. Sven O. Krumke, Manuel Streicher and myself, which we hereby submit to the *Electronic Journal of Graph Theory and Applications*.

In the paper we investigate the problem of simultaneously dominating all spanning trees of a graph with as few vertices as possible – MINSIMULTANEOUSDOMINATINGSET. We prove that in a 2-connected graph a subset of the vertices simultaneously dominates all spanning trees of this graph if and only if it is a vertex cover. As one of the main results of our manuscript we prove that MINSIMULTANEOUSDOMINATINGSET is NP-hard on perfect graphs. This is of particular interest as it is well known that a minimum vertex cover can be found in polynomial time on perfect graphs. Thereby, we establish a crucial difference in the complexity of the two problems and show that although we can solve MINSIMULTANEOUSDOMINATINGSET on 2-connected, perfect graphs in polynomial time, we cannot achieve the same on general perfect graphs, unless P $=$ NP. In some sense one could say that the problem significantly simplifies when restricting it to 2-connected graphs which is a property that is rarely seen among graph theoretic problems, as most problems that can be solved efficiently on 2-connected graphs may also be solved efficiently on all graphs.

We further present an exact algorithm for MINSIMULTANEOUSDOMINATINGSET that uses an oracle for finding a minimum vertex cover. We argue that this algorithm can be implemented to run in polynomial time, when the input graph is restricted to bipartite graphs, chordal graphs, or graphs of bounded treewidth.

Finally, we present a 2-approximation based on LP-rounding for finding a minimum size subset of vertices that simultaneously dominate all spanning trees of a given graph. The 2-approximation is not an immediate consequence of the 2-approximability of finding a minimum vertex cover: We show that the size of a minimum vertex cover and the size of a minimum subset of vertices that is dominating in all spanning trees may differ by a factor of up to 2 and

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prove that this bound is tight.

We appreciate your efforts and are looking forward to hearing from you.

Yours sincerely,

Sebastian Johann