

The Disjoint Paths Problem on Chordal Graphs

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Abstract. Algorithms based on a bottom-up traversal of a tree decomposition are used in literature to develop very efficient algorithms for graphs of bounded treewidth. However, such algorithms can also be used to efficiently solve problems on chordal graphs, which in general do not have a bounded treewidth. By combining this approach with a sparsification technique we obtain the first linear-time algorithm for chordal graphs that solves the k -disjoint paths problem. In this problem k pairs of vertices are to be connected by pairwise vertex-disjoint paths. We also present the first polynomial-time algorithm for chordal graphs capable of finding disjoint paths solving the k -disjoint paths problem with minimal total length. Finally we prove that the version of the disjoint paths problem, where k is part of the input, is \mathcal{NP} -hard on chordal graphs.