Efficiently enumerating minimal triangulations. (English) Zbl 07395742

Summary: We present an algorithm that enumerates all the minimal triangulations of a graph in incremental polynomial time. Consequently, we get an algorithm for enumerating all the proper tree decompositions, in incremental polynomial time, where “proper” means that the tree decomposition cannot be improved by removing or splitting a bag. The algorithm can incorporate any method for (ordinary, single result) triangulation or tree decomposition, and can serve as an anytime algorithm to improve such a method. We describe an extensive experimental study of an implementation on real data from different fields. Our experiments show that the algorithm improves upon central quality measures over the underlying tree decompositions, and is able to produce a large number of high-quality decompositions.

MSC:
05C30 Enumeration in graph theory
05C70 Edge subsets with special properties (factorization, matching, partitioning, covering and packing, etc.)
68R10 Graph theory (including graph drawing) in computer science
68Q25 Analysis of algorithms and problem complexity

Keywords:
minimal triangulation; tree decomposition; enumeration algorithm; minimal separators; maximal independent sets; maximal cliques

Full Text: DOI

References:
[14] Dahlhaus, D., Chapter minimal elimination ordering inside a given chordal graph, (WG (1997), Springer Berlin Heidelberg: Springer Berlin Heidelberg Berlin, Heidelberg), 132-143 - Zbl 0886.05103
[18] Golumbic, M. C., Chapter 4 - triangulated graphs, (Golumbic, M. C., Algorithmic Graph Theory and Perfect Graphs (1980), Academic Press), 81-104
[45] Zhao, J.; Malmberg, R. L.; Cai, L., Rapid ab initio RNA folding including pseudoknots via graph tree decomposition, (WABI (2006)), 262-273

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically selected to be relevant to the context of the natural text.
matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.