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TREE DECOMPOSITIONS WITH BOUNDED INDEPENDENCE NUMBER: BEYOND INDEPENDENT SETS

Recently Dallard, Milanič, and Štorgel introduced and studied tree decompositions with bounded independence number: the size of a largest independent set contained in a single bag of the decomposition. Their motivation was to be able to solve INDEPENDENT SET: given a graph with a tree decomposition of bounded independence number, this problem can be solved in polynomial time.

We extend the algorithmic applicability of tree decompositions with bounded independence number to other problems. First, we show that in polynomial time we can find a largest induced subgraph of bounded chromatic number, satisfying some prescribed CMSO$_2$-formula. Example of problem that can be expressed in this language are finding a largest induced tree (equivalent to FEEDBACK VERTEX SET) or finding a largest induced planar subgraph (equivalent to PLANARIZATION).

Second, we show that we can efficiently solve DISTANCE-d INDEPENDENT SET for even d. In stark contrast, for d odd the problem is NP-hard.

Quite surprisingly, similar phenomena can be observed in graphs with no long induced cycles.

This is joint work with Martin Milanič.