Using ILPs to solve the crossing number problem

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The crossing number of a graph is the minimum number of edge crossings in any drawing of the graph in the plane. It has been studied extensively in the literature both from a mathematical point of view – in terms of various bounds for different classes of graphs – as well as from the algorithmical standpoint, e.g. in terms of heuristics.

We present an integer linear programming formulation, including cut heuristics and an efficient pricing scheme. In conjunction with novel preprocessing algorithms, it can be used to solve the NP-hard problem of computing the crossing number for small to medium sized graphs.

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