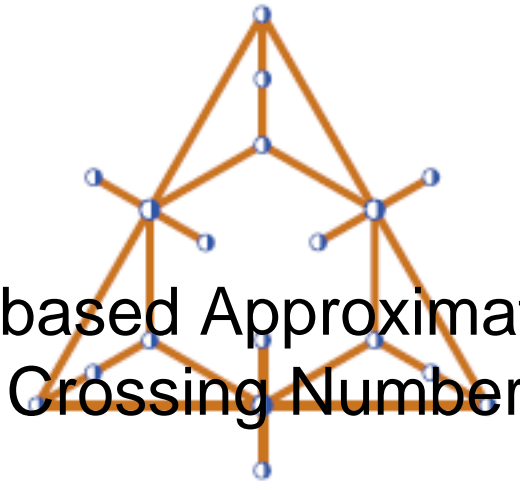


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Insertion-based Approximation of the Crossing Number



Content :

Let G be a planar graph and F a set of additional edges not yet in G . The {em multiple edge insertion} problem (MEI) asks for a drawing of $G+F$ with the minimum number of pairwise edge crossings, such that the subdrawing of G is plane. As an exact solution to MEI is NP-hard for general F , we present the first approximation algorithm for MEI which achieves an additive approximation factor (depending only on the size of F and the maximum degree of G) in the case of connected- G . Our algorithm seems to be the first directly implementable one in that realm, too, next to the single edge insertion.

It is also known that an (even approximate) solution to the MEI problem would approximate the crossing number of the {em F -almost-planar graph} $G+F$, while computing the crossing number of $G+F$ exactly is NP-hard already when $|F|=1$. Hence our algorithm induces new, improved approximation bounds for the crossing number problem of F -almost-planar graphs, achieving constant-factor approximation for the large class of such graphs of bounded degrees and bounded size of F .

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