DETERMINISTIC FULLY DYNAMIC DATA STRUCTURES FOR VERTEX COVER AND MATCHING.

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Abstract

We present the first deterministic data structures for maintaining approximate minimum vertex cover and maximum matching in a fully dynamic graph $G = (V, E)$, with $|V| = n$ and $|E| = m$, in $o(\sqrt{m})$ time per update. In particular, for minimum vertex cover we provide deterministic data structures for maintaining a $(2 + \epsilon)$ approximation in $O(\log n/\epsilon^2)$ amortized time per update. For maximum matching, we show how to maintain a $(3 + \epsilon)$ approximation in $O(\min(\sqrt{n}/\epsilon, m^{1/3}/\epsilon^2))$ *amortized* time per update, and a $(4 + \epsilon)$ approximation in $O(m^{1/3}/\epsilon^2)$ *worst-case* time per update. Our data structure for fully dynamic minimum vertex cover is essentially near-optimal and settles an open problem by Onak and Rubinfeld from STOC' 2010.

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