

Determining the smallest k such that G is k -outerplanar

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Abstract. The outerplanarity index of a planar graph G is the smallest k such that G has a k -outerplanar embedding. We show how to compute the outerplanarity index of an n -vertex planar graph in $O(n^2)$ time, improving the previous best bound of $O(k^3 n^2)$. Using simple variations of the computation we can determine the radius of a planar graph in $O(n^2)$ time and its depth in $O(n^3)$ time.

We also give a linear-time 4-approximation algorithm for the outerplanarity index and show how it can be used to solve maximum independent set and several other NP-hard problems faster on planar graphs with outerplanarity index within a constant factor of their treewidth.

Key words: outerplanarity index, k -outerplanar, fixed-parameter algorithms, NP-hard, SPQR trees