

# On computing the vertex connectivity of 1-plane graphs

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**Abstract:** A graph is called 1-plane if it has an embedding in the plane where each edge is crossed at most once by another edge. A crossing of a 1-plane graph is called an X-crossing if the endpoints of the crossing pair of edges induce a matching. In this paper, we show how to compute the vertex connectivity of a 1-plane graph  $G$  without X-crossings in linear time.

To do so, we show that for any two vertices  $u, v$  in a minimum separating set  $S$ , the distance between  $u$  and  $v$  in an auxiliary graph  $\Lambda(G)$  (obtained by planarizing  $G$  and then inserting into each face a new vertex adjacent to all vertices of the face) is small. It hence suffices to search for a minimum separating set in various subgraphs  $\Lambda_i$  of  $\Lambda(G)$  with small diameter. Since  $\Lambda(G)$  is planar, the subgraphs  $\Lambda_i$  have small treewidth. Each minimum separating set  $S$  then gives rise to a partition of  $\Lambda_i$  into three vertex sets with special properties; such a partition can be found via Courcelle's theorem in linear time.

**Presenter:** MURALI, Karthik

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