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Toward a Theory of Planarity: An algorithm for simultaneous planarity?

We study relationships between various notions of planarity and show how some recent results on Hanani-Tutte style theorems for those planarity notions suggest a uniform algebraic approach to all these notions. As a result, we can exhibit a polynomial-time algorithm that may decide simultaneous planarity, c-planarity, partially embedded planarity, etc., with the one caveat that we can only prove correctness of the algorithm relative to some redrawing conjectures. The algorithm is self-aware in the sense that it would recognize a counterexample to its correctness.