Deleting a maximal planar graph from a genus embedding

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Abstract

A toroidal graph can be edge partitioned into a planar graph and an outerplanar graph. We would like to study a more general question: Given a genus embedding of a graph $G$ in a surface $S_g$, what information we may obtain if a maximal planar graph is deleted from $G$. In particular, how much the genus of the resulting graph can be reduced, i.e., is there a non-trivial upper bound for the genus of the resulting graph? This problem is related to the thickness of graphs, as well as partitioning graphs into simpler subgraphs. We realized that this problem is closely related to system of non-contractible and non-homotopic loops with a common base point in a surface, such that any pair of loops either homotopically disjoint or intersect exactly once, all at the base point.

In this talk, we will discuss the maximum number of loops in such loop system for oriented surfaces, and the connection between the loop system and the decomposition problem.