5. Homework | Total points: 40

Advanced Graph Algorithms — SS 2012

Ran Duan, Jens M. Schmidt, Magnus Wahlström | Tutor: Bernhard Schommer

Exercise 1: Combinatorial Embeddings *(8 points)*

Let G be a planar embedding. Let A be a set of lists, one for each face of G, such that each list contains all the edges of its face in clockwise order. Show that A and a combinatorial embedding are equivalent in the sense that they define each other.

Exercise 2: Reducing Planarity *(10 points)*

Show that a graph is planar if and only if its 2-connected components are planar.

Exercise 3: Dual Graphs *(10 points)*

Is G^* connected for every planar (not necessarily connected) graph G? Find a counterexample or proof.

Exercise 4: Colorings *(12 points)*

Let G be a graph with maximal vertex degree k. Find an efficient algorithm that colors G with $k + 1$ colors. Faster running time $\Rightarrow$ more points.