Psuedo one-sided rectangular duals

Sander Beekhuis

December 1, 2016

Setting A *rectangular layout* is a partition of a rectangle into a finite set of interior disjoint rectangles. The interior of this rectangle thus contains vertical and horizontal line segments, such a segment is *maximal* if it can't be extended any further on either side. A rectangular layout is *one-sided* if every maximal segment is the side of a single rectangle.

The *rectangular dual* of a graph G is a rectangular layout whose rectangles have the same adjacencies as the vertices of G. To make such a dual one usualy adds 4 corner vertices to G to obtain an *extended graph*.

Some rectangular duals are better then others. For example *area-universal* rectangular duals have adjacencies that hold regardless of the areas we assign to each rectangle.

Eppstein et al. have shown that rectangular duals are area-universal exactly when they are one-sided. [1] They show one can compute such a rectangular dual with a FPT algorithm if it exists. Unfortunately not all graphs admit a one-sided dual, an example is given by Rinsma. [2]

Work Since not all graphs admit a *one-sided* rectangular dual we relax this condition slightly and consider *psuedo one-sided* rectangular duals. Where we enforce that every maximal segment is on the same side of k adjacent rectangles, with k some (hopefully) small constant.

We show that extended graphs containing a separating 4-cycle in general do not admit psuedo-onesided duals.

We conjecture that all extended graphs without any separating 4-cycle can be colored in a pseudo one-sided way. And will show our progress on this conjecture so far.

References

[1] D. Eppstein, E. Mumford, B. Speckmann, and K. Verbeek. "Area-Universal and Constrained Rectangular Layouts". In: *SIAM Journal on Computing* 41.3 (2012), pp. 537–564. DOI: 10.1137/110834032.

[2] I. Rinsma. "Nonexistence of a certain rectangular floorplan with specified areas and adjacency". In: *Environment and Planning B: Planning and Design* 14.2 (1987), pp. 163–166. DOI: 10.1068/b140163.