

Fun with Toroidal Spring Embeddings

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Tuttes classical spring embedding theorem is the foundation of hundreds of algorithms for drawing and manipulating planar graphs. A somewhat less well-known generalization of Tuttes theorem, first proved by Yves Colin de Verdière in 1990, applies to graphs on more complex surfaces. I will describe two recent applications of this more general theorem to graphs on the Euclidean flat torus. The first is a natural toroidal analogue of the Maxwell-Cremona correspondence, which relates equilibrium stresses, orthogonal dual embeddings, and weighted Delaunay complexes. The second is a simple and natural algorithm to continuously morph between geodesic torus graphs, generalizing a planar morphing algorithm of Floater and Gotsman.