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Random embeddings

An embedding of a connected graph on an orientable surface can be described (up to a homeomorphism) by providing a cyclic permutation for each vertex to describe the ordering of edges incident with the vertex. By choosing each of the permutations uniformly at random we get a random embedding of the given graph.

The study of random embeddings was started by Stahl and White in the 1990's, the main questions were the distribution of genus (equivalently, of the number of faces). The case of a multigraph with a single vertex and with two vertices was completely understood. We extend this to multistars, multigraphs where all edges are incident with a single vertex. We use Stanley's result on enumerating permutations to precisely bound the expected number of faces of a multistar. We apply this to get an estimate on the expected number of faces of a general graph in terms of its degeneracy. We also report on work-in-progress about getting a logarithmic bound on the expected number of faces of a complete graph.

Joint work with Jesse Campion Loth, Kevin Halasz, Tomáš Masařík, and Bojan Mohar.