In pursuit of canonical structures on cellularly embedded graphs

Jason Suagee, The George Washington University, Washington DC – 20052

Abstract

In the mid 2000's Stefan Felsner (from TU Berlin) developed methods, given a planar embedded graph G, of associating a distributive lattice structure to the set of directed edge structures on G. This is now referred to as the theory of alpha-orientations, and can be used to derive canonical structures for any given planar embedded graph, in particular, canonical spanning trees and $2k$ factors. The theory has also been extended by several authors, who produce methods of bijectively constructing planar triangulations and several other families of planar maps, which are important, for instance, for 2D-Quantum Gravity simulations. – In this talk I will summarize Felsner's theory, and explain a recent generalization of his methods to the case of higher genus cellularly embedded graphs. I will also present a potential application to physics (in Quantum String Theory), which occurs though applying combinatorial methods to the theory of moduli spaces of complex curves, which are used to parametrize the functional integrals that govern the dynamics in string theory.

Keywords: graph, planar embedding, alpha-orientation, quantum string theory.