

Talk Math 2 Me

Friday November 9, 2018
DERR 240
12:00pm- 1:00pm

Oriented Hypergraphs and the Total Minor Polynomial

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Abstract

The generalization of concepts of graph theory to integer matrices can be done through the use of oriented hypergraphs. An oriented hypergraph is an incidence structure where each incidence is oriented by a positive or negative one. Given this incidence structure, Seth Chaiken's All-Minors Matrix-Tree Theorem is translated to an integer matrix that provides an hypergraphic generalization of Kirchhoff's Laws showing that conservation occurs only when G is a graph. This is done by a continuation of the results obtained by Rusnak, Robinson et. al. in the establishment of the hypergraphic Matrix-tree Theorem and through their work with the characteristic polynomial of integer matrix Laplacians of Sachs' Theorem. Restricted sub-monic mappings of paths of length one into the oriented hypergraph, characterized by the incident matrix used to produce the Laplacian, are used to calculate the determinants of the ordered, iterated minors of an integer matrix Laplacian. These calculations yield the natural coefficients of the polynomial produced by introducing $|V|^2$ indeterminants into the Laplacian. The mappings that do not cancel for degree-1 monomials produce coefficients that are in one-to-one correspondence with Tutte's Matrix-Tree Theorem. Furthermore Tutte's 2-arborescence decomposition is in one-to-one correspondences with these coefficients and the contributors associated with them.

Upcoming Fridays will feature student presentations of projects and research. Look for flyers hanging around the department or check the math department webpage for all updates on Talk Math 2 Me!

To sign up to speak, contact Ellen Robinson at ebr21@txstate.edu.