

Combinatorial Optimization of Matrix-Vector Multiplication
Michael Wolf
University of Illinois

Abstract

Work by Kirby, et al. (2006) showed the combinatorial optimization of matrix/vector multiplication could lead to the faster evaluation of finite element stiffness matrices. Using relationships between rows, an efficient set of operations can be generated to perform matrix-vector multiplication. My improved graph model of this problem solves this combinatorial optimization problem optimally for binary row relationships. I extend the representation by using hypergraphs to model more complicated row relationships, expressing an n -row relationship with an n -vertex hyperedge. My initial greedy algorithm for this hypergraph model has yielded significantly more optimal results than the graph model for many matrices.