1073-05-83 **Linyuan Lu*** (lu@math.sc.edu), Columbia, SC 29208, and **Xing Peng**. *High-ordered Random Walks and Generalized Laplacians on Hypergraphs.*

Despite of the extreme success of the spectral graph theory, there are relatively few papers applying spectral analysis to hypergraphs. Chung first introduced Laplacians for regular hypergraphs and showed some useful applications. Other researchers treated hypergraphs as weighted graphs and then studied the Laplacians of the corresponding weighted graphs. In this paper, we aim to unify these very different versions of Laplacians for hypergraphs. We introduce a set of Laplacians for hypergraphs through studying high-ordered random walks on hypergraphs. We prove the eigenvalues of these Laplacians can effectively control the mixing rate of high-ordered random walks, the generalized distances/diameters, and the edge expansions. (Received July 27, 2011)