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Carsten L Peterson* (carsten.peterson@yale.edu). *Some Results on Two-Lifts of Graphs*. Preliminary report.

Let $\lambda(G)$ be the largest modulus of all non-trivial eigenvalues of the adjacency matrix of a d -regular graph G . A d -regular graph with $\lambda(G) \leq 2\sqrt{d-1}$ is called Ramanujan, which is an extremal property of d -regular graphs. Marcus, Spielman and Srivastava recently proved the existence of bipartite Ramanujan graphs of all degrees using what they call the method of interlacing families of polynomials. Their proof depended on performing 2-lifts of graphs based on a signing of the edges, and that the eigenvalues of bipartite graphs are symmetrically distributed. Motivated by the goal of proving the existence of non-bipartite Ramanujan graphs of all degrees, we examine 2-lifts of graphs. Notably, we introduce a class of signings of lifted graphs which give symmetrically distributed eigenvalues (relatively self-complementary signings), combinatorially characterize the coefficients of the expected characteristic polynomial of this class of signings, give a recursive method for calculating the matching polynomial of the 2-lift of a graph, as well as an explicit method for performing a Ramanujan 2-lift of the complete graph for all n . (Received September 16, 2014)