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Applications and limitations of the normalized Laplacian matrix for graphs. Preliminary report.

By associating a graph with a matrix, we can ascertain properties of the graph by studying the spectrum of the matrix. Some common matrices that have been associated with graphs are the adjacency matrix A , which places a 1 in entries corresponding to edges and 0 otherwise; the Laplacian matrix $L = D - A$ where D is a diagonal degree matrix; and the signless Laplacian matrix $Q = D + A$.

Another matrix we can associate with a graph is the normalized Laplacian, $\mathcal{L} = D^{-1/2}(D - A)D^{-1/2}$, popularized by the work of Fan Chung. This matrix shares many properties in common with A, L, Q but also has differences. In this talk we will survey some of the applications of the normalized Laplacian as well as give some limitations to what the matrix can tell us about a graph. (Received September 22, 2011)