Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

An Easy Method for Finding the Scattering Coefficients of Quantum Graphs and Some Applications SETH COTTRELL, New York Univ NYU
— Quantum walks are roughly analogous to classical random walks, and like classical walks they have been used to find new (quantum) algorithms. When studying the behavior of large graphs or combinations of graphs it has often been useful to find the response of a subgraph to signals of different frequencies. In this talk I'll be presenting a simple technique for quickly finding the scattering coefficients of any quantum graph. This is done by imitating the scattering states using normalizable states on a modified version of the graph. These scattering coefficients can be expressed entirely in terms of the characteristic polynomial of the graph's time-step operator. With these coefficients in hand we can replace an entire subgraph with a single vertex whose behavior is frequency dependent. This gives us a powerful set of tools for rapidly understanding the behavior of more complex structures. Time permitting, I will apply these tools to several types of graphs (star, complete, tree) demonstrating how we can gain information about the structure of these graphs by bouncing signals off of them, describing the limitations on what information cannot be accessed, and even show how to construct some computations using quantum walks that can be run in faster than classical time.

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Date submitted: 12 Nov 2014 Electronic form version 1.4