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Limiting behavior of coined quantum walks with marked vertices

A quantum walk based search algorithm assigns to the marked vertices a special coin that incorporates the oracle. In this talk, we consider such walks where the marked vertices receive $-I$ while the unmarked vertices receive the Grover coin. We find combinatorial bases for the eigenspaces of the transition matrix, show their connection to submatrices of the adjacency matrix, Laplacian matrix and signless Laplacian matrix, and use this connection to study the limiting behavior of the walk. This is joint work with Amulya Mohan.