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postal 12-808, col. Narvarte, 03001 Mexico City, Mexico. *Quantum Walks with Entangled Coins  
and Walkers in Superposition.*

The role of entanglement in quantum walks is an open area of research. In [1], Venegas-Andraca *et al* introduce the notion of quantum walks using pairs of coins under different degrees of freedom and numerically shows asymptotical properties, particularly the ‘three peak localization phenomenon’, that were analytically proved later on (the ‘three peak localization phenomenon’ reflects the degeneracy of some eigenvalue of the quantum walk evolution operator) [2].

We introduce a generalization of quantum walks with entangled coins [1] consisting of a model of discrete quantum walks with coin pairs under various degrees of entanglement and walkers in quantum superposition as initial states. We introduce novel position probability distributions that may be used for algorithm development based on quantum-mechanical phenomena.

[1] S.E. Venegas-Andraca, J.L. Ball, K. Burnett, S. Bose, Quantum Walks with Entangled Coins, *New J. Phys.*, 7 221, 2005.

[2] C. Liu, N. Petulante, One-dimensional quantum random walks with two entangled coins, *Phys. Rev. A*, 79(3):032312, 2009. (Received September 16, 2015)