Non-stochastic one-dimensional lackadaisical quantum random walks

Yun-Chih Liao[1*], Hsi-Sheng Goan[3,4], Hao-Chung Cheng[2,1]

[1]*Graduate Institute of Communication Engineering, National Taiwan University, Taipei, Taiwan*
[2]*Department of Electrical Engineering, National Taiwan University, Taipei, Taiwan*
[3]*Department of Physics and Center for Theoretical Physics, National Taiwan University, Taipei, Taiwan*
[4]*Center for Quantum Science and Engineering, National Taiwan University, Taipei, Taiwan*

* Presenter:Yun-Chih Liao, email:yunchihliao@gmail.com

We investigate the evolution of discrete-time one-dimensional lackadaisical quantum random walk (LQW) with step- and position- dependent coins. The coins are characterized by the rotation angles, which depend on the step of the walk or the position of the quantum walker, respectively. For different rotation angles, such a coin leads to diverse probability distributions of the walks. We explore the entropy dynamics associated with the position space and the walker's internal degrees of freedom space, the so-called coin space. We demonstrate how the probability distributions vary with the angles of the coins. This enables us to properly control the LQW, which might lead to future technological applications.

Keywords: quantum random walk, lackadaisical walk, Shannon entropy