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Quantum Walks: Fundamental Ideas and Applications

Quantum walks, while interesting from a fundamental physical perspective, are also known for the applications in realising quantum information protocols, with the most famous probably being the use of the Grover walk to implement the Grover search algorithm.

In this presentation I will give a brief introduction to quantum walks and then detail three examples relating to fundamental properties, applications and new walks. In the first I will show how the quintessential two-dimensional Grover walk can be realised using an effectively one-dimensional model, which requires significantly less resources. I will then present an idea for using a quantum walk to construct a localised and secure quantum memory and will finally introduce two new ideas for creating different kinds of walks.

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