Mini Project:

Implementation of Discrete Time Quantum Walks on Quantum Computer using Qiskit

Week 1

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About the Project

- This mini project is an implementation of the quantum analog of the mathematical concept Random walk, i.e Quantum walk, on a Real Quantum computer.
- Our implementation would be of the discrete time Quantum walk on the integer line, also referred to as the one-dimensional discrete time quantum walk.

Random Walk

A random walk is a stochastic process that consists of the sum of a sequence of changes in a random variable, where these changes are uncorrelated with past changes.

Quantum Walk

Quantum walk are quantum analogues of classical Random walks, which in contrast to random walks have definite states and the randomness arises due to the stochastic transitioning between the states.

- There are two broad classes of quantum walk
  - Discrete time quantum walk
  - Continuous time quantum walk
- Our project focuses on the simplest form of discrete time quantum walk, the one dimensional discrete time quantum walk.
- Any Quantum Walk has 3 major components
  - A coin operator
  - Shift operator
  - Initial coin state

Project Overview

- This project is going to be implemented on Qiskit, which is an open-source software to work with quantum computers.
- We will also be using Quantum Composer and Quantum Lab provided by IBM.
- Our main goal of the project is to implement the Algorithm of One dimensional Discrete time quantum walk for qubit systems.

Thankyou