Quantum Computing and Cryptography - 11: Basics of Measuring a Qubit

Length	Micromodule
Collection	NSA NCCP
Updated	March 14, 2019
Contributors	Abhishek Parakh
Academic Levels	Undergraduate, Graduate
Topics	Quantum Computing
Link	https://clark.center/details/aparakh/abcb3d51-7e23-4f3e-8920-b407a420c24f

Description

In this lesson the students will learn the formal notions of measuring a qubit, computing probabilities of outcomes, transition amplitudes from one state to the other and the notions of global and local phases.

Although the files are marked nanomodule, finishing all the material will take between 1 to 4 hours. Hence, it is categorized as micromodule.

Email Dr. Abhishek Parakh at aparakh@unomaha.edu for solutions to the problems.

Note: To get started with Jupyter notebooks please follow the userguide available at: https://sites.google.com/unomaha.edu/userguideqcl/

Outcomes

- Evaluate transition amplitudes from one state to the other.
- Explain the notion of global and local phase and their interpretations.
- Outline the basics of measuring a qubit.
- Calculate the probabilities of outcomes upon measurement.

Alignment

The standards and guidelines this learning object is mapped to

- CAE Cyber Defense (2014) - Probability and Statistics: Students will be able to evaluate probabilities to solve applied problems.
- NICE Workforce Knowledge (2017) - K0052: Knowledge of mathematics (e.g. logarithms, trigonometry, linear algebra, calculus, statistics, and operational analysis).
- CS2013 (2013) - Discrete Probability: Apply Bayes theorem to determine conditional probabilities in a problem.