Matrix Theory in a Simple Quantum Adder

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Matrix Analysis

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Presentation layout

1. Quantum what?
2. Matrix Theory
3. Simulation on IBM-Q
4. Recap

Quantum what?

Some ideas about quantum mechanics.
Bits and qubits. Quantum states. Measurement. Collapsing. Reversible.
Quantum computation? Information?
The big picture.

Terminology

Physics terms and math terms.

Recipe

What do we need to make this simple circuit?
How does matrix theory (might) play a role here?

Discrete and Quantum Fourier Transform

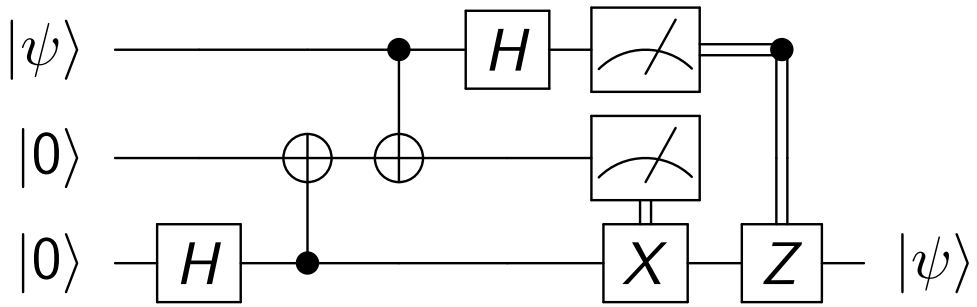
Constructing a DFT matrix. Properties of this matrix. Orthonormal basis.

Control-phase gate

Again?

Simulation on IBM-Q

A sample quantum circuit.



Recap

What did we learn on the show tonight, Craig?
Q-circuit user guide [EF04]
quantum addition of classical numbers [CC16]
Mike and Ike [NC02]
Handbook of Linear Algebra [Hog06]
addition on quantum computer [Dra00]
QFT quick math [Bac]
Matrix analysis (where I read about unitary matrices) [HJ90]

References

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- AV Cherkas and SA Chivilikhin, *Quantum adder of classical numbers*, Journal of Physics: Conference Series, vol. 735, IOP Publishing, 2016, p. 012083.
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- Roger A. Horn and Charles R. Johnson, *Matrix analysis*, Cambridge university press, 1990.
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- Michael A Nielsen and Isaac Chuang, *Quantum computation and quantum information*, 2002.