Qubit Dynamics: Introducing to Future Computing Technology

Introduction(This part should give a brief explain about what is quantum computing and what is the qubit)

In quantum computing and information, a qubit is a key building block that represents a two-level quantum system. With a developed quantum computer, people could simulate real quantum phenomenon and generate true random number, which would lead a revolution in data security, data storage capability and speed of calculation. The impact of quantum computing has never been less than the discovery to the usage of fire.

What is Qubit:

Qubit, also known as Quantum bit, is a concept in quantum physics. It is a particle that exists in a superposition state. Throw a classic coin, the result would be either face up or face done. However, a 'quantum coin' could represent both face up and face done.

Face down Face up Face up&Face down?

Similarly, as a common bit could only represent 0 or 1 in binary system, a quantum bit can represent both 0 and 1 state. Represent this 0 and 1 as wave, and call 0 "Spin down", call 1 "Spin up", we get the basic quantum represent for a qubit.

Spin down Spin up Superposition

The property of qubit enables it to contain more information than a classic bit. It has been given a huge perspective in further usage. One typical is the storage. Comparing to 2 classic bits which can store 2×2 bits of message, 2 qubits can store 2^2 bits of message with the combination [up, up], [up, down], [down, up], [down, down]. The advantage of using qubits overkills classic bits as the number of calculating units increase. Quantum Supremacy is used to describe this huge difference in performance, even though currently there is no generally accepted evidence for which association has proven this idea.

How to simulate a qubit in classic computer

Matrix is one of the best way to describe a quantum particle in a classic computer. As for the previous concept of "spin up" and "spin down", they are represented by (0 1) and (1 0) prospectively. Any operation are represented by operators, for example the position operator times the matrix gives the position of the qubit, and the Hamiltonian operator, which is the key operator discussed here, results the effect from a laser field to the qubit.

Latest News:

(This part should contain some encouraging developments in the recent world.)

Monte Carlo Algorism

--Simulation

Monte Carlo simulation is a way to simulate a random phenomenon. It has been regarded as one of the best way do describe random phenomenon using classical way. The key features of this simulation is comparison, iteration, .At a specific time, a random number is generated, and one comparison is made due to some rules. After the comparison, the function steps to the next time after a short period δt. The hole Monte Carlo simulation is the repetition of these steps.

This is picture for Monte Carlo simulation

Optical Bloch Equation

--numerical solution

This is for the description for the analytical optical Bloch equation and its graphs.

Simple analysis

This part is for analysis whether the Monte Carlo simulation is in accordance with the analytical Optical Bloch Equation.

Plot here

Picture for quantum computers
(Used for explanation to the left)

Picture for Superconductivity and quantum computing.
(Use for explanation to the bot)

Connection with other projects

(This part should state the related part of technologies)

Error corrections
Superconductivity with quantum computing
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To be finished

References
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Liu, Y., Zhao, Q., Li, MH. et al. Device-independent quantum random-number generation. Nature 562, 548–551 (2018). https://doi.org/10.1038/s41586-018-0559-3