IBM : QUANTUM COMPUTER

Tue 13 Nov 2018

https://quantumexperience.ng.bluemix.net/qx/editor

- MAX 5 Qubits
- Allows Simulating the QComputer
- " Running the QComp for real
- Different interfaces for programming
  - GUI
  - QASM
  - Python API

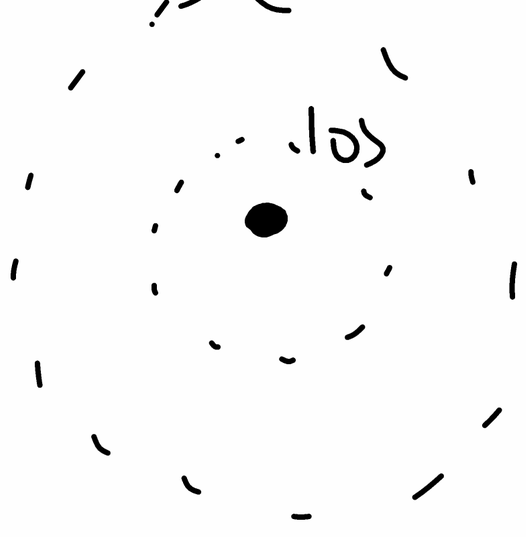
MANY QUANTUM CIRCUIT SIMULATORS

ex. http://algassert.com/quirk

more: Google

ACTUAL Q COMPUTER is HIGHLY SUSCEPTIBLE TO PERTURBATIONS FROM ENVIRONMENT. Eg. Heat

⇒ Gives rise to two problems



(A) $|1\rangle \longrightarrow |0\rangle$ "Excited" state gets unstable

The time that $|1\rangle$ stays stable is called T_1

⇒ You better do your calculations in LESS THAN T_1 seconds

(B) After a time T2 we loose the precise information of any superposition

$$\frac{1}{\sqrt{2}}\left(|0\rangle + |1\rangle\right) \xrightarrow{T2} a|0\rangle + b|1\rangle$$

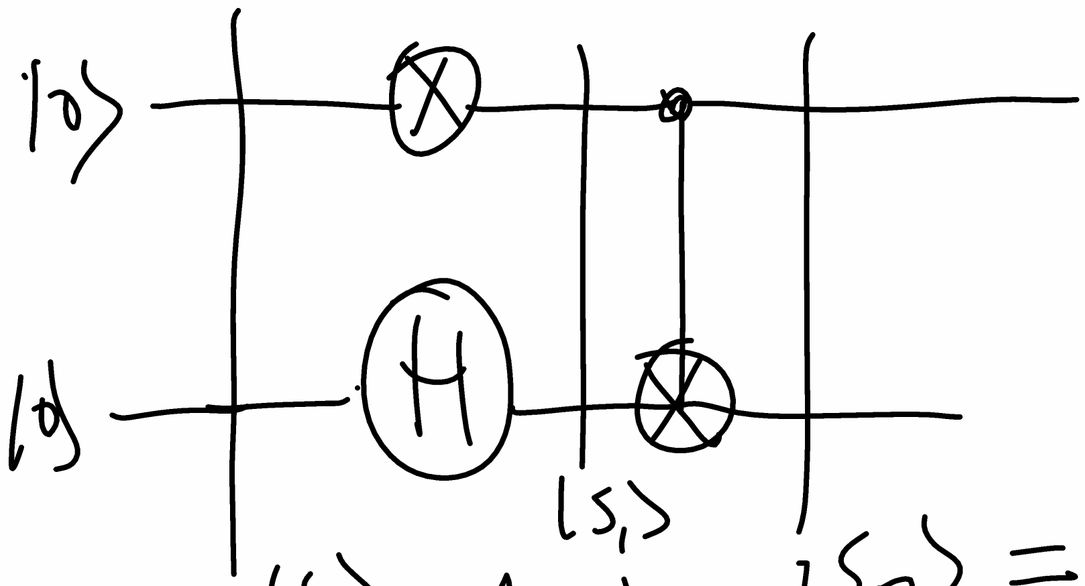
$a|0\rangle$ ↔ ? ↕ $b|1\rangle$

DUE TO THIS PHYSICAL LIMITATIONS

THE WHOLE SCIENCE OF Q COMP RELIES ON

ERROR CORRECTING ALGORITMS

Eg. Parity check



$|s_0\rangle = |00\rangle$

$|s_1\rangle = \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)|1\rangle = \frac{1}{\sqrt{2}}(|01\rangle + |11\rangle)$

$|s_2\rangle = |s_1\rangle$

$|s_3\rangle = CNOT_{12}|s_2\rangle = \frac{1}{\sqrt{2}}\left(\underbrace{CNOT_{12}|01\rangle}_{|11\rangle} + \underbrace{CNOT_{12}|11\rangle}_{|01\rangle}\right)$

ASSIGNMENT 4

1) $|W1\rangle = (H|1\rangle)(H|0\rangle) =$

$= \frac{1}{\sqrt{2}}(|0\rangle - |1\rangle)\ \frac{1}{\sqrt{2}}(|0\rangle + |1\rangle)$

$= \frac{1}{2}(|00\rangle + |01\rangle - |10\rangle - |11\rangle)$

$|W2\rangle = (ZH|1\rangle)(XH|0\rangle)$