IBM Quantum Creative Challenge

- Interference visualization -

Team:

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Issues faced and problems we overcame

- Drawing with matplotlib
- Understanding how to use Qiskit, basic concepts of quantum programming and interference.

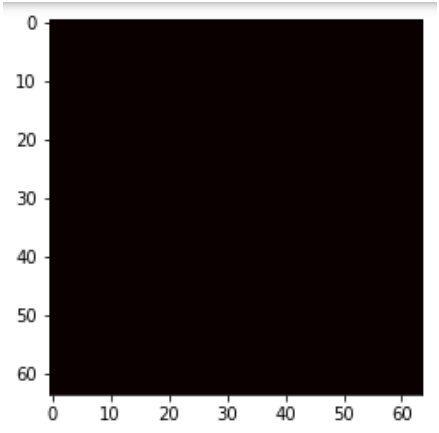
Future implications of your project

- Helps people understand visually how interference is changing uncertain states into certain states.

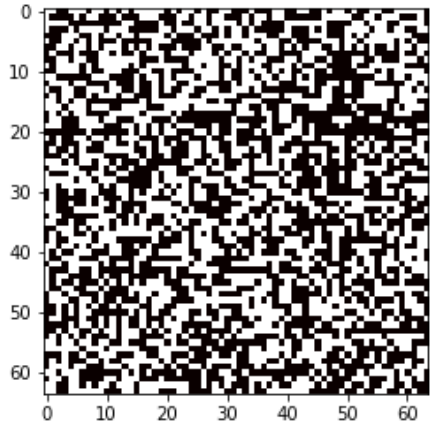
How your project could benefit the quantum computing community

- It shows the difference between circuits with interference and circuits without interference.

A simple example, with only one interference: In the moment in which we have an odd number of H-gates, the state is uncertain; in the moment we have an even number of H-gates, the state is certain, and it is always 0.

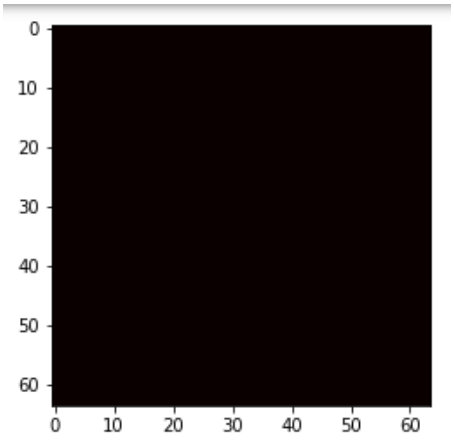


With interference

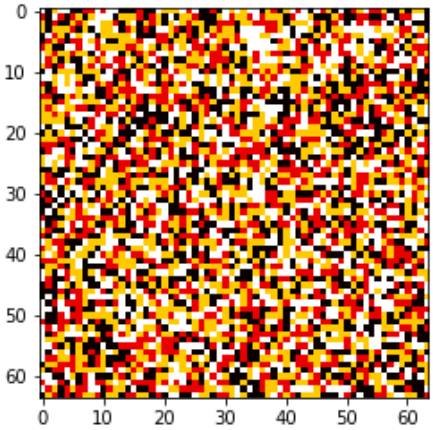


Without interference

A more complex example, in which we put the same number of H-gates on qubit 1 and qubit 2. Total interference is created when we have an even number of H-gates, creating the interference.



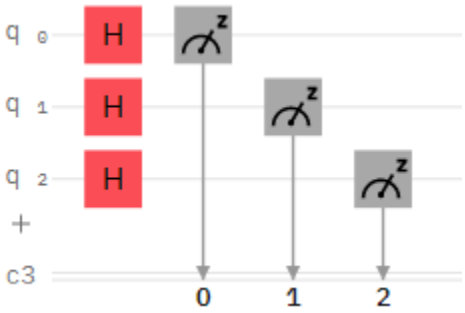
With interference

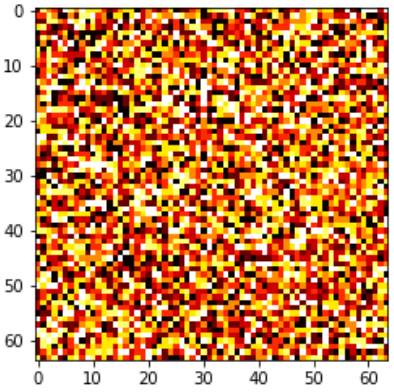


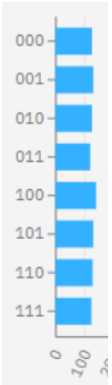
Without interference

We also took a special case in which we verified all the different situations for 3 qubits.

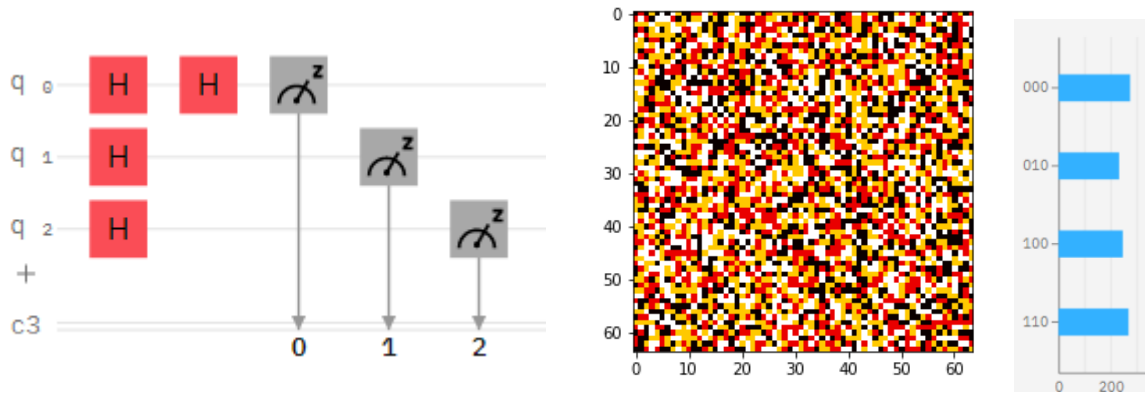
- None of the qubits have interference. There is a pretty equal distribution between all the possible states.



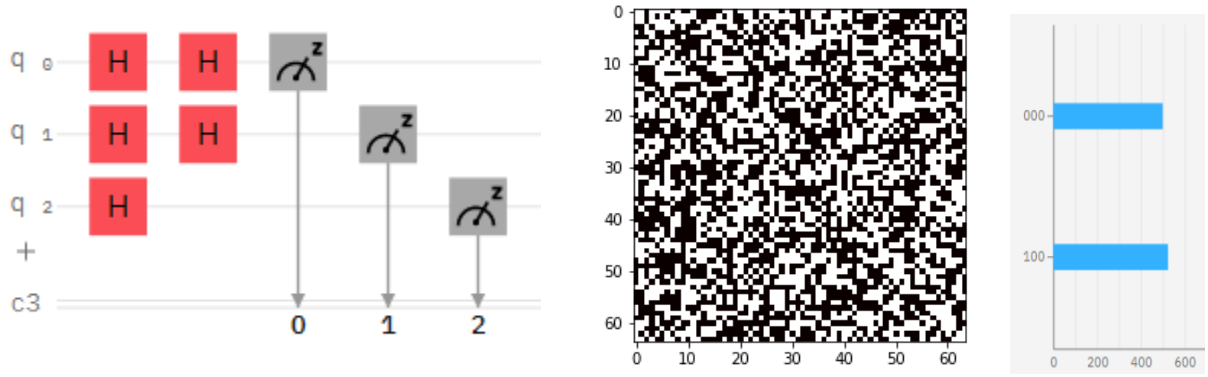




- Only one qubit has interference. We can observe that there are less states generated because the last qubit (q0) becomes certain, being 0.



- Two qubits have interference. We can observe that there are even less states generated because the qubits q0 and q1 become certain, being 0.



- All the qubits have interference. There can be only one state generated (000) because all the qubits have a certain state.