

qiskit-example

April 12, 2023

1 Jupyter Notebook with Qiskit and Python 3 Kernel

An example of a Jupyter Notebook with Qiskit and a Python 3 Kernel.

1.1 Information

The GitHub Codespaces environment has installed all required packages and dependencies.

1.2 Setup

The following steps are required to setup the Jupyter Notebook with a Python 3 Kernel.

1. Select the Python 3 (ipykernel) Kernel in the Jupyter Notebook menu **Kernel** → **Jupyter Kernel** → **Python 3 (ipykernel)**.
2. Run the Jupyter Notebook.

1.3 Qiskit Example - Apply Hadamard Gates and Draw Circuit

A Qiskit program that applies a Hadamard gate to n qubits initialized at $|0\rangle$, measured, and drawn as a quantum circuit.

1.3.1 Import Modules

Import the Qiskit Python modules.

```
[ ]: from qiskit import Aer, assemble, transpile
      from qiskit import QuantumCircuit, QuantumRegister
      from qiskit.visualization import plot_histogram
```

1.3.2 Create a Qiskit Program

Create a Quantum Circuit with n qubits apply a Hadamard gate to each qubit, and measure the qubits.

```
[ ]: quantum_register = QuantumRegister(3, 'q')
      quantum_circuit = QuantumCircuit(quantum_register)

      quantum_circuit.h(quantum_register[0])
      quantum_circuit.h(quantum_register[1])
      quantum_circuit.h(quantum_register[2])
```

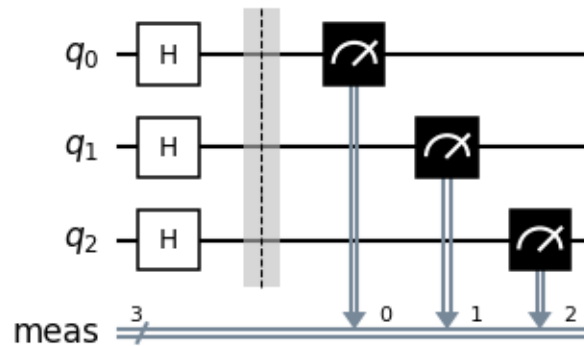
```
quantum_circuit.measure_all()
```

1.3.3 Draw a Quantum Circuit

Draw the quantum circuit. Use the `mpl` output format to draw the circuit using Matplotlib. It uses the `style` parameter to set the style to `bw` for black and white. The scale is set to `0.75` to make the circuit smaller.

```
[ ]: quantum_circuit.draw(output='mpl', style='bw', scale=0.75)
```

```
[ ]:
```



1.3.4 Plot a Quantum Circuit

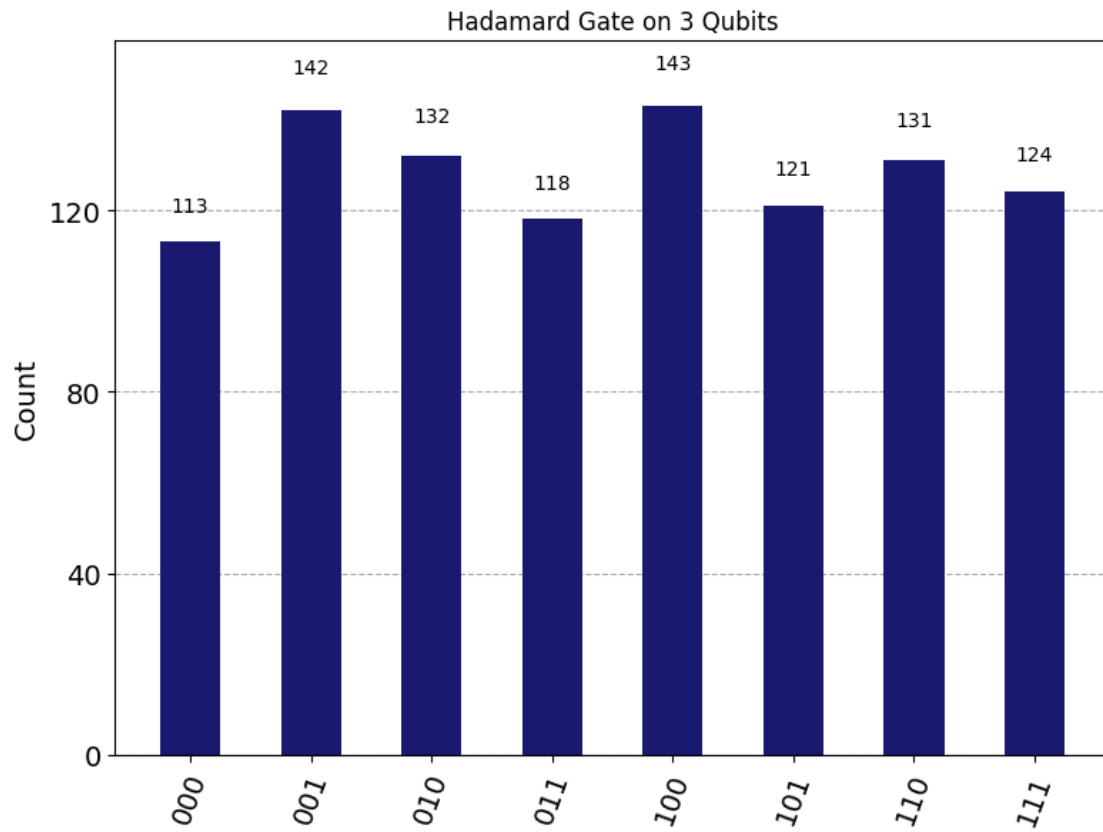
Use the `plot_histogram` function to plot the quantum circuit. The `plot_histogram` function takes a dictionary of counts and plots a histogram of the counts. The title is 'Hadamard Gate on 3 Qubits' and the x-axis is 'Count'. The style is set to `color='midnightblue'` to make the bars blue and the `figsize=(9, 6.5)`.

```
[ ]: aer_sim = Aer.get_backend('aer_simulator')
transpiled_quantum_circuit = transpile(quantum_circuit, aer_sim)

quantum_object = assemble(transpiled_quantum_circuit)
results = aer_sim.run(quantum_object).result()
counts = results.get_counts()

plot_histogram(
    counts,
    title='Hadamard Gate on 3 Qubits',
    color='midnightblue',
    figsize=(9, 6.5)
)
```

```
[ ]:
```



1.4 Resources

- [Qiskit Documentation](#)
- [Qiskit](#)