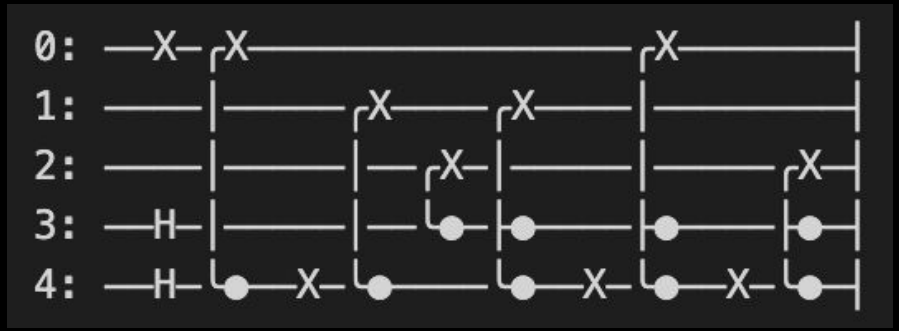
What if music is quantum?

Coconutshell (team 10)

Quantum Circuit

```python
import pennylane as qml
dev = qml.device('default.qubit', wires=5, shots=1)
```




```python
@qml.qnode(dev)
def quantum_walk(input_node):

    for i in range(3):

        if input_node[i]==1:
            qml.PauliX(i)

    qml.Hadamard(3)
    qml.Hadamard(4)
    qml.CNOT([4, 0])
    qml.PauliX(4)
    qml.CNOT([4, 1])
    qml.CNOT([3, 2])
    qml.MultiControlledX([4,3], 1)
    qml.PauliX(4)
    qml.MultiControlledX([4,3], 0)
    qml.PauliX(4)
    qml.MultiControlledX([4,3], 2)

    return qml.sample()
```

< IonQ >'s Challenge

iQuHACK 2024

Qbit assignment and pitch mapping

```
pitch_mapping = {
    '000': 48,  # C3
    '001': 52,  # E3
    '010': 55,  # G3
    '011': 59,  # B3
    '100': 60,  # C4 (Middle C)
    '101': 64,  # E4
    '110': 67,  # G4
    '111': 71,  # B4
}
```

Creating a MIDI file to generate music

```
track = 0
channel = 0
time = 0
duration = 1
tempo = 90
volume = 100

MyMIDI = MIDIFile(1)
MyMIDI.addTempo(track, time, tempo)

quarter_note = 1
half_note = 2
```

```
def find_pitch(v):
    key = str(v).replace(' ', '').replace('[', '').replace(']', '')
    return pitch_mapping[key]
```

Outputting the music into the midi file

```
def find_pitch(v):
    key = str(v).replace(' ', '').replace('[', '').replace(']', '')
    return pitch_mapping[key]

v = np.array([0,0,0])
for i in range(n):
    v = step(v)
    pitch = find_pitch(v)
    print(pitch)
    print(f"Pitch: {pitch}, Type: {type(pitch)}")
    MyMIDI.addNote(track, channel, pitch=pitch, duration=quarter_note, time=i, volume=volume)

    MyMIDI.addNote(track, channel, pitch=pitch, duration=quarter_note, time=i, volume=volume)

output_file_path = "pleasework.mid"
outf = open(output_file_path, 'wb')
MyMIDI.writeFile(outf)
outf.close()
```