Quantum Whack-A-Mole

A slightly violent way to learn quantum circuits

QCB

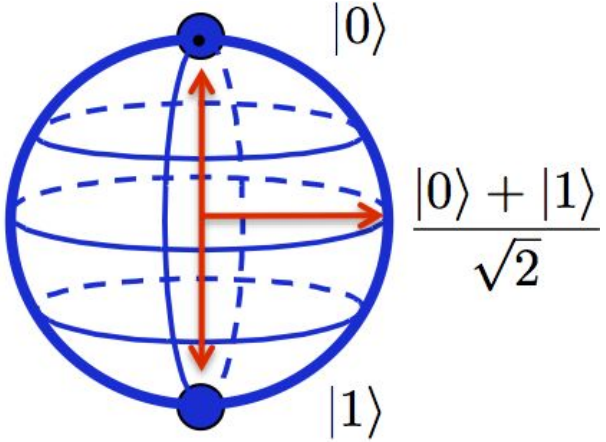
Who are we?

- Berkeley undergrads new to quantum computing.
- PST + IST = less hours
- Wanted to have fun!

Quantum What-a-Mole?

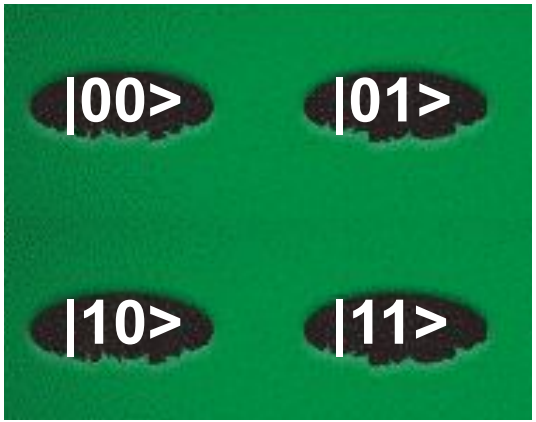
+

2 x



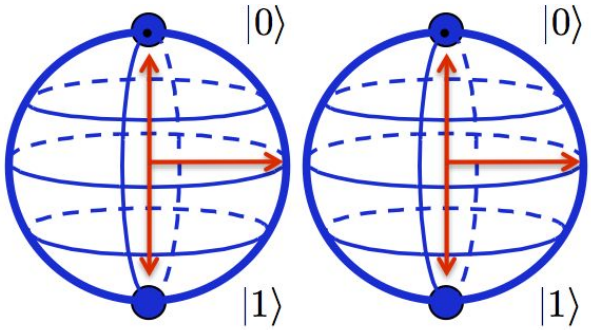
Qubit

Qhack-A-Mole!

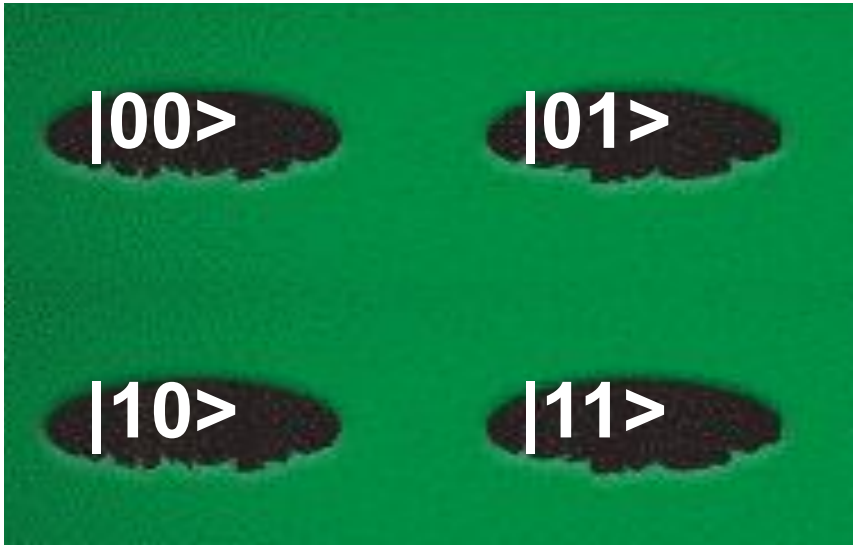


Quantum Hammer

Boring Hammer



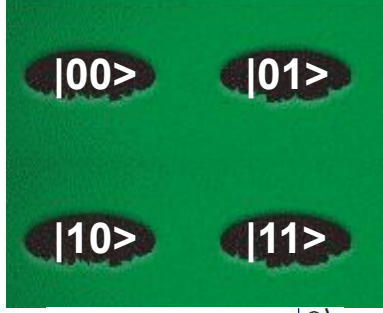
Game start state

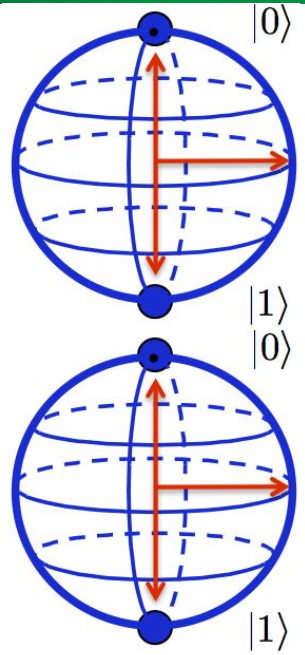


- a|00> + b|01> + c|10> + d|11>
- a^2 - probability of a mole being in the hole |00>
- a,b,c,d are unknown to player

Quantum Hammer

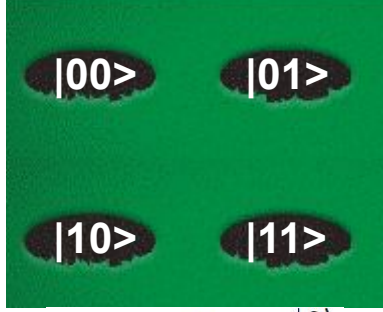
1. **Probability amplitude of a state** you whack
2. **Add a gate**:
   - H, Z, Y, X, Cnot, R
3. **Circuit is printed**

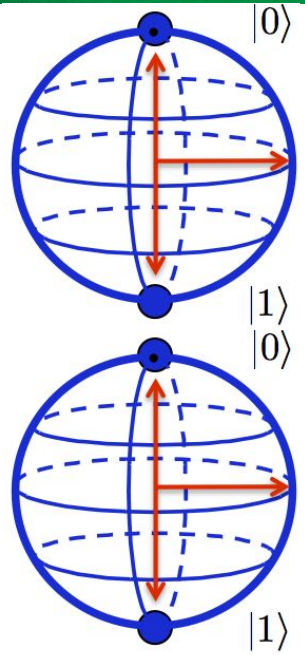




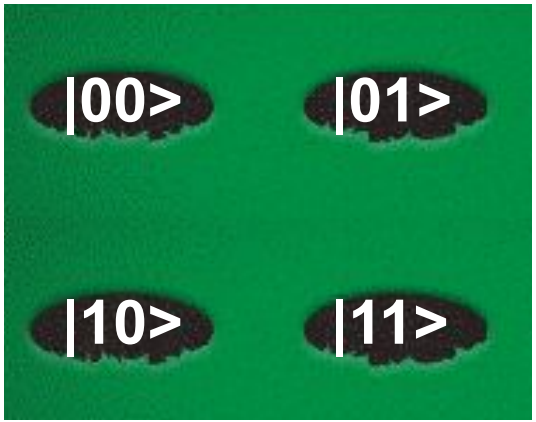
Classical Hammer

1. **Measures** both qubits
2. **Compares the state** to the state you whacked
3. **Win** if it's the same
4. **Lose** otherwise



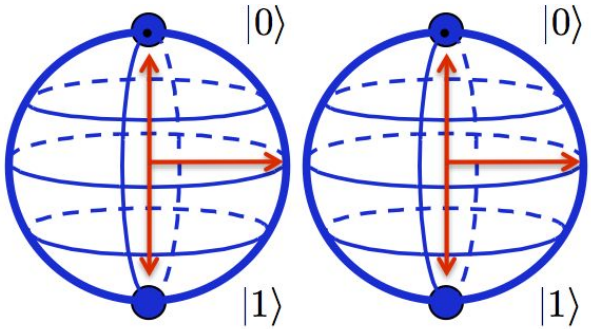


Demo



Quantum Hammer

Boring Hammer



Possible improvements

1. Making amplitudes friendlier
2. Better UI
3. Larger board
4. GUI

Utility

1. **Simple game that teaches quantum circuits.**
2. Finished product in short time.
3. Lots of fun!

*****No mole was harmed in production**