Electrodynamics
Notes

1 Recap/Intro

Remember that the reason that quantum computers are better than classical computers is that for given states, a quantum computer doesn't have to go through all of them - rather, it can just set up a bunch of states as a superposition and deal with it all in one fell swoop. This concept is called quantum parallelism, since quantum computers are essentially a bunch of classical computers operating side by side.

solution.

2 Today's stuff

Classically, we write code to find solutions. In quantum, we can write code to confirm a solution. For example, take the following two problems:

$$\text{Find all x for which } x^2 + x - 6 = 0$$

$$\text{Confirm that 2 is a solution to } x^2 + x - 6 = 0$$

Classically, doing the first is really bad - you'd have to just plug in over and over. However, quantumly, just plug things in and they work out on their own by parallelism. As far as code flow goes, we can first generate all possible solutions to a problem, and then pass that into an operator that confirms the valid among those "solutions".

Essentially, that means that there are 3 steps to most quantum coding:

1. Generate all possible solutions
2. Confirm out which ones are valid via a parallelism structure
3. Measure the results and done!

Now, let's say Alice and Bob are playing a game. Here's what happens:

1. Alice picks a random binary 4-bit number (e.g. 0000,0001,...1111) and denotes it as a vector, $\overrightarrow{x}$. She gives that vector to Bob.
2. Bob applies a function $f(\vec{x}) = \{0, 1\}$ The function is either constant (i.e. always returns 0 or 1) or it's a balance function (by some parameters it selects whether to return a 0 or 1, each with 50% probability).
3. Bob returns that output to Alice.
4. Alice tries to guess whether or not the function is balanced or constant.

There's two possible constant functions, and two possible balanced functions, for N=1 qubits.

3 What's next