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**EE 5340**

**Prepare the initial state :**

Creating the first qubit state that will be send:

1. q1 = ket(sqrt(0.6),sqrt(0.4))
2. print(dirac(q1))
4. //output
5. [1] "0.775|0> + 0.632|1>"

Generating EPR pair:

1. q23 = intket(x=c(0,1,2,3),n=2,amplitudes=c(1,0,0,1))
2. print(dirac(q23))
4. //output
5. [1] "0.707|00> + 0.707|11>"

Combine them to create 3-qubit states:

1. qu = tensor(q1,q23)
2. print(dirac(qu))
4. //output
5. [1] "0.548|000> + 0.548|011> + 0.447|100> + 0.447|111>"

**Step 1 - CNOT gate:**

Perform CNOT-gate on qubit 2 controlled by qubit 1. This will flip the state of qubit 2 if and only if the state of qubit one is 1.

1. qu <- tensor(CX(),I()) %\*% qu
2. print(dirac(qu))
4. //output
5. [1] "0.548|000> + 0.548|011> + 0.447|101> + 0.447|110>"

**Step 2 - H gate:**

Perform H-gate on qubit 1. This force qubit 1 to split its probity between the state 0 and 1 that will translate into after H-gate transformation.

1. qu <- tensor(H(),I(),I()) %\*% qu
2. print(dirac(qu))
4. //output
5. [1] "0.387|000> + 0.316|001> + 0.316|010> + 0.387|011> + 0.387|100> + -0.316|101> + -0.316|110> + 0.387|111>"

**Step 3 - Measurement:**

Measure qubit 1 and qubit 2. This will make them collapse to either 0 or 1 with the following probability. Those probabilities are dependent solely on the initial state of qubit 1.

1. L <- measure(qu, 0, 1, l2r=TRUE)
2. qu <- L[[1]]
3. print(dirac(qu))
5. //output is going to be one of those 4 states:
6. [1] "0.775|000> + 0.632|001>"
7. //OR
8. [1] "0.632|010> + 0.775|011>"
9. //OR
10. [1] "0.775|100> + -0.632|101>"
11. //OR
12. [1] "-0.632|110> + 0.775|111>"

**Step 4 - Corrective X or Z gates:**

On qubit 3, performing X-gate contorted by qubit 2 followed by Z-gate contorted by qubit 1 to produce the following:

1. // X and Z gate performance depending on the previous measurement
2. qu <- controlled( gate=X(), n=3, cQubits=1, tQubit=2) %\*% qu
3. qu <- controlled( gate=Z(), n=3, cQubits=0, tQubit=2) %\*% qu
4. print(dirac(qu))
6. //output
7. [1] "0.775|000> + 0.632|001>"
8. //OR
9. [1] "0.775|010> + 0.632|011>"
10. //OR
11. [1] "0.775|100> + 0.632|101>"
12. //OR
13. [1] "0.775|110> + 0.632|111>"

Qubit 3 will have the initial state of qubit 1. Finalizing the teleportation of the state of qubit from one end of the quantum circuit to the other.