No-cloning theorem

$|\psi\rangle = a|0\rangle + b|1\rangle \longrightarrow \boxed{U} \longrightarrow a|0\rangle + b|1\rangle$

classical

x OR $0 = x$

1 or $0 = 1$

0 or $0 = 0$

~~progess~~. Raw material

you want a clone of ~~x~~.

$|0\rangle^{0} \to x$

We want $|0\rangle$ to become $|\psi\rangle$

$U(|\psi\rangle|0\rangle) \longrightarrow |\psi\rangle|\psi\rangle$.

Say $|\psi\rangle = (a|0\rangle + b|1\rangle)$.

$|\psi\rangle|0\rangle = (a|0\rangle + b|1\rangle)\cdot(|0\rangle$

$a|00\rangle + b|10\rangle$

You apply CNOT to the above and get $a|00\rangle + b|11\rangle$

expected state

$|\psi\rangle|\psi\rangle$

$(a|0\rangle + b|1\rangle)\cdot(a|0\rangle + b|1\rangle)$

$a^2|00\rangle + b^2|11\rangle + ab|01\rangle + ab|10\rangle$

$a|00\rangle + b|11\rangle = a^2|00\rangle + b^2|11\rangle + ab|01\rangle + ab|10\rangle$

~~ab~~ ~~also ab~~

$a^2 = a$ $\Rightarrow b = 0$ $\Rightarrow ab \neq 0$

$b^2 = b$ $a = 1$ $\Rightarrow$ No values of a,b.

$ab = 0$

~~only possible if $a = 1, b = 0$ that is it is possible to clone $|0\rangle$ only~~

→ main aim of cloning is to create a copy of unknown state.

→ If we know in advance, what already the thing is then we can create it! Thats not cloning.