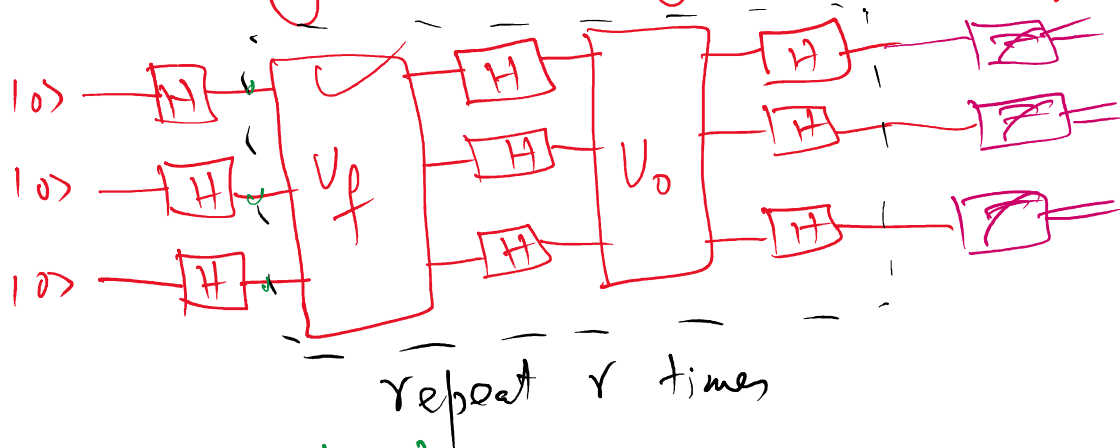


Simulating Grover Algorithm: on qiskit 1.x



$$r = \frac{\pi}{4\alpha} - \frac{1}{2}$$

$$\alpha = \sin^{-1} \frac{1}{\sqrt{N}}$$

$$n = 3$$

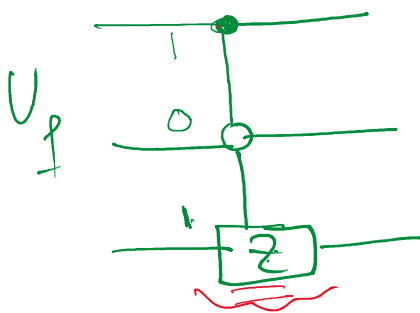
$$N = 2^3 = 8$$

$$r = 3.4$$

$$\rightarrow r = \text{int}(3.4) = 3$$

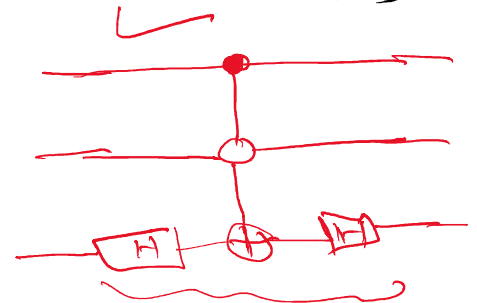
$$U_f = |w\rangle\langle w| - |w\rangle\langle w|$$

$$|w\rangle = |110\rangle$$



$$|110\rangle \rightarrow -|110\rangle$$

$$Z = HXH$$



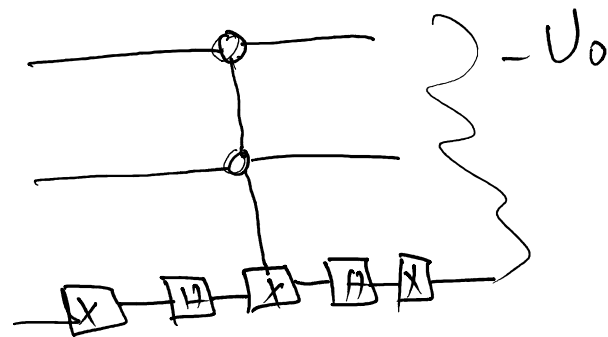
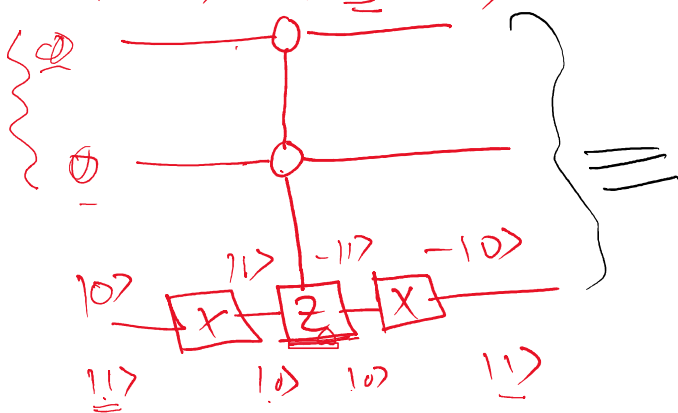
$$\underline{U_0} = \underline{2|0\rangle\langle 0| - I}$$

instead of U_0 , better to implement $-U_0$

$$-U_0 = \underline{I - 2|0\rangle\langle 0|} = \begin{pmatrix} -1 & 0 & 0 & 0 & \vdots \\ 0 & 1 & 0 & 0 & \vdots \\ 0 & 0 & 1 & 0 & \vdots \\ \vdots & \vdots & \vdots & \vdots & \ddots \end{pmatrix}$$

$$|0\rangle = |000\rangle$$

$$|000\rangle \rightarrow \underline{-|000\rangle}$$



$$\text{---} \bigcirc \text{---} \equiv \text{---} \boxed{X} \text{---} \bigcirc \text{---}$$