Quantum Computing

Assessed Coursework (II)

Handed Out: 21/02/01 To be Handed in: 7/03/01

In the Grover's algorithm, let $n = 2$ so that $N = 2^n = 4$, and let $M = 1$. The oracle f with $f(x) = 0$ for all $x \neq x_0$ and $f(x_0) = 1$ can be chosen from the four circuits in Figure 1, corresponding to $x_0 = 0, 1, 2, 3$ respectively from left to right.

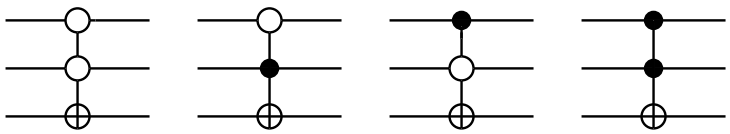

Figure 1: Four possible oracles

Show that the circuit in Figure 2 in effect implements the operation G. How many iterates of G are needed to determine x_0?

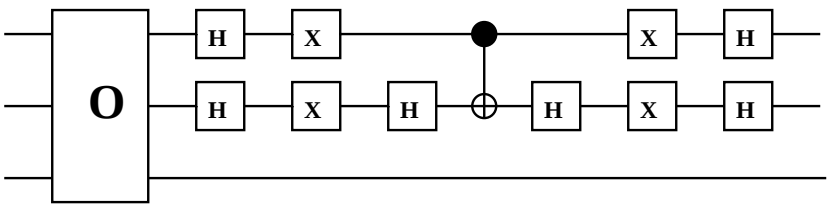

Figure 2: Circuit for G