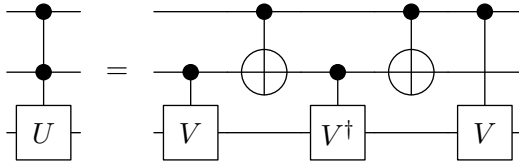**Theorem 2** *A unitary gate controlled by two control bits can be expressed in terms of singly controlled quantum gates as follows:*

where V is a 2×2 unitary matrix such that $U = V^2$.