Proposal for Quantum Reversible Synthesis

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Abstract

0.1 problem definition

There are a number of classical circuits that benefit from the property of being a mathematical bijection. For instance a hash function necessarily needs to be a mathematical bijection in order to ensure there are no collisions in the mapping from inputs to hash outputs. Unfortunately, ¡computationally efficient¿ methods do not currently exist to determine if a circuit is in fact a bijection. We propose the implementation of a software synthesis tool based on current work in the literature to determine if a classical circuit is a mathematical bijection. If this circuit is synthesizable as a quantum cascade with no garbage outputs and no ancillia inputs then we know the circuit is logically reversible and is a bijection.

0.2