The Necessary and Sufficient Conditions for a Universal Conservation of a State of a Unitary Quantum Circuit

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Abstract: By A. Peres and A. Stern's opinions a computational process evolves along a cyclic logic orbit defined by the sequence $\psi_0 \to \psi_1 \to \ldots \to \psi_{M-1} \to \psi_0$. It begins from a start position and returns to the same position after a computation. A. Stern thought that if we could design such a circuit, its operations can be extended to including nonconservative behavior associated with the external perturbations or internal quantum errors. A. Peres did not discuss how to make $\varphi_{M-1} = \varphi_0$. A. Stern proposed only a necessary condition for a conservation of a state of a quantum circuit. In this paper we present a necessary and sufficient condition for a universal conservation of a state of a quantum circuit. We also find all operators which can allow the conservation.

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