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【572】 Reassessing the computational advantage of quantum-controlled ordering of gates

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In quantum computation, indefinite causal structures allow to perform certain tasks more efficiently than any conventional (causal) quantum algorithm. For example, the quantum switch can decide whether two unitary gates commute or anticommute with a single call to each gate, while in any causal quantum algorithm at least one gate has to be called twice. A generalization of this task to n unitary gates, can be solved with the quantum-n-switch and a single call to each gate, while it was expected that the best causal algorithm calls $O(n^2)$ gates. We present more efficient causal algorithms for this task and conclude that this advantage is smaller than expected so far.

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