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Title: Optimal probabilistic storing and retrieving of unitary channels

Abstract:

The original aim of quantum memory is to store quantum states, however, here we address the question of a quantum memory storage of quantum dynamics. In particular, we design the optimal protocol for N to 1 probabilistic storing-and-retrieving of unitary channels on d -dimensional quantum systems. If we may access the unknown unitary gate only N -times, the optimal success probability of perfect retrieving of its single use is $N/(N-1+d^2)$. The derived size of the memory system improves exponentially the known upper bound on the size of the program register needed for probabilistic programmable quantum processors.