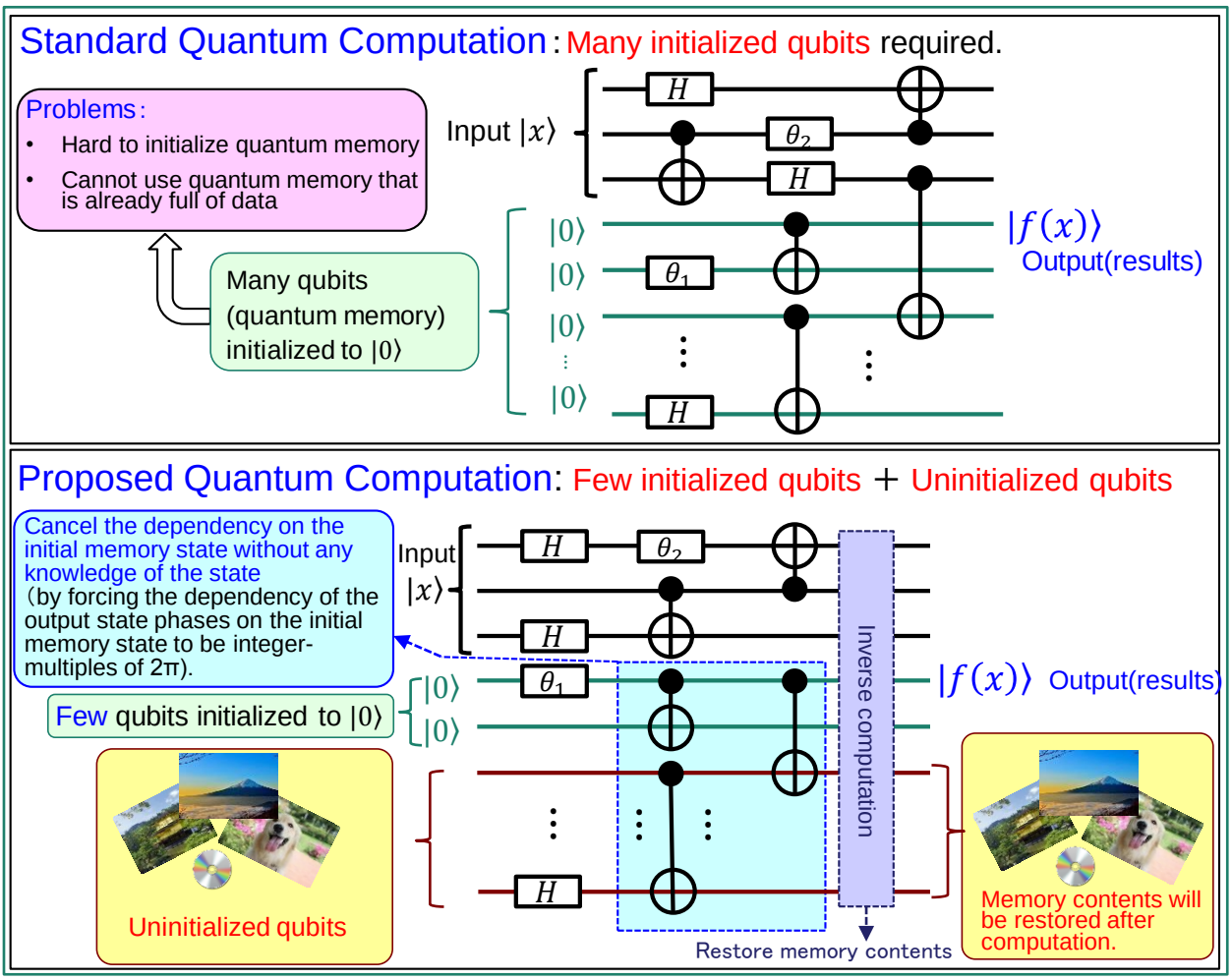
08 Can I borrow your quantum memory?

- High-speed quantum computations with uninitialized qubits -

Abstract

Memory initialization is generally a process that must be performed before classical/quantum computation. With quantum computers, however, this process is not easy as regards physical implementation. This study shows how to exactly compute certain complicated functions with a quantum memory whose initial state is unknown. The key technique is to cancel the dependency of the output quantum state on the unknown initial state of the quantum memory without any knowledge of the initial state. Furthermore, the initial state is restored after the computation. This effectively makes it possible to share the quantum memory among multiple quantum computational tasks, and thus leads to higher parallelism and broader applicability.



References

[1] Y. Takahashi, S. Tani, “Power of uninitialized qubits in shallow quantum circuits,” in *Proc. 35th Symposium on Theoretical Aspects of Computer Science (STACS 2018)*, pp. 57:1-57:13, 2018.
[2] Y. Takahashi, S. Tani, “Power of uninitialized qubits in shallow quantum circuits,” *arXiv:1608.07020v3*.

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