Repetition of unknown quantum gates

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Abstract

Existence of no-go theorems plays a major role in quantum information science. The impossibility of perfect cloning of states or unknown unitary gates, the failure of programming a quantum gate array or controlling an unknown operation are some examples. These results are fundamental to key distribution, quantum secret sharing and quantum error correction.

In this talk, another no-go theorem will be introduced. First, I will discuss the usage of the gate repetition in quantum computation and in different algorithms. Then, I will prove it is impossible to construct a deterministic quantum circuit that repeats an unknown unitary gate by calling it only once. Finally, a quantum circuit that approximately bypasses this no-go result will be presented and using the notion of process fidelity, its performance will be evaluated.

References

[1] G. Chiribella, G. M. DAriano, and P. Perinotti, *Optimal Cloning of Unitary Transformation*, Phys. Rev. Lett. 101, 180504 (2008), arXiv:0804.0129 [quant-ph]