Review of: "Design of Quantum Gates Using Quantum Scattering Theory"

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Design of Quantum Gates Using Quantum Scattering Theory

Review report

The manuscript should be written as a formal paper.

The abstract is too long and does not succinctly and concisely present the method and the conclusions.

The equations should be numbered.

When an abbreviation first appears, such as TPCP and NSUT, all the words should be given explicitly.

The references should be numbered in the order they appear.

The entire information of each reference should be given, such as the year of publication.

Considering the contents reflected by the title, usually, much more than five references should be cited.

References are not cited in the Abstract. Usually, one does not comment on others' work in the Abstract.

Section 2 just repeated the scattering theory presented in the literature, such as Ref. [4] in the manuscript and [1] here.

The authors simply copied the Lippmann-Schwinger equation [2] as the second equation in the manuscript, but they did not know how this equation was derived.

The derivation in this section is not rigorous. The W matrices were not needed. These operators unnecessarily confused the concepts of states. They were introduced simply because the original derivation in [2] was not rigorous, in spite of the fact that the famous Lippmann-Schwinger scattering equation was correct. Please see the correct derivation of the Lippmann-Schwinger equation in [3].

This section was not related to quantum gates.

Section 3 just repeated the expression of the S matrix, but in an unnecessarily complicated way.

Section 4 simply gave the expression of the time evolution operator, which already appeared in the literature, usually in the books of many-body theory [4].

The formulas in Section 5 did not embody noise.

Summary.

This manuscript simply repeated the formulas concerning the scattering theory appearing in the literature already.

There is no connection between a scattering state and a state in a quantum circuit.

This manuscript has nothing to do with quantum gates, not to mention the design of quantum gates.

In the abstract, the authors said: "we propose numerical methods for such optimization." Actually, they did nothing.

References

[1] John R. Taylor, Scattering Theory: The Quantum Theory of Nonrelativistic Collisions, John Wiley & Sons, Inc., New York (1972).

[2] B. A. Lippmann and J. Schwinger, Variational principles forscattering processes I, Phys. Rev.**79,** 469–80 (1950).

[3] Huai-Yu Wang, A generalized scattering theory in quantum mechanics

J. Phys. Commun.**7**, 075001 (2023). https://doi.org/10.1088/2399-6528/acde44

[4] Huai-Yu Wang, Green's Function in Condensed Matter Physics, Alpha Science International Ltd. and Science Press (2012).