

Peer Review

Review of: "A Review of Formal Methods in Quantum Circuit Verification"

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The paper focuses primarily on monolithic quantum circuits. However, it does not explore the formal verification of distributed quantum protocols, which involve multiple quantum nodes connected via quantum networks.

While the review covers traditional logic and model checking, it does not detail the use of diagrammatic methods like the ZX-calculus.

These two papers can also be added to the reference:

1. On the Verification of Quantum Circuits (Research Challenges and Opportunities).
2. Formal Verification of Quantum Programs: Theory, Tools, and Challenges

The author mentions regarding the application of barrier certificates in section 3.3, "Barrier certificates have been successfully applied to the verification of a variety of quantum circuits, including Grover's search algorithm and other quantum oracles." Can you also cite the reference?

Table 1 summarizes the various barrier certificate types and their strengths, limitations, etc. Can they also refer to the paper here where these are particularly achieved?

In section 3.3, these two sentences in the first paragraph are redundant. Please check.

"Barrier certificates have been successfully applied to the verification of a variety of quantum circuits, including Grover's search algorithm and other quantum oracles. Researchers have evaluated different classes of barrier certificates—such as polynomial, exponential, and rational functions—to identify the most effective choice for each application."

"Barrier certificates have been successfully applied to verify various quantum circuits, including Grover's quantum search algorithm and other quantum oracles. Researchers have compared the

performance of different types of barrier certificates (e.g., polynomial, exponential, and rational functions) to determine the most suitable certificate for each case.

Although this paper reviews many formal methods used for verifying quantum circuits, how this will impact under the consideration of noise models is not fully discussed.

Declarations

Potential competing interests: No potential competing interests to declare.