Synthesizing Verifiable Compiler Toward Fault-Tolerant Quantum Computing

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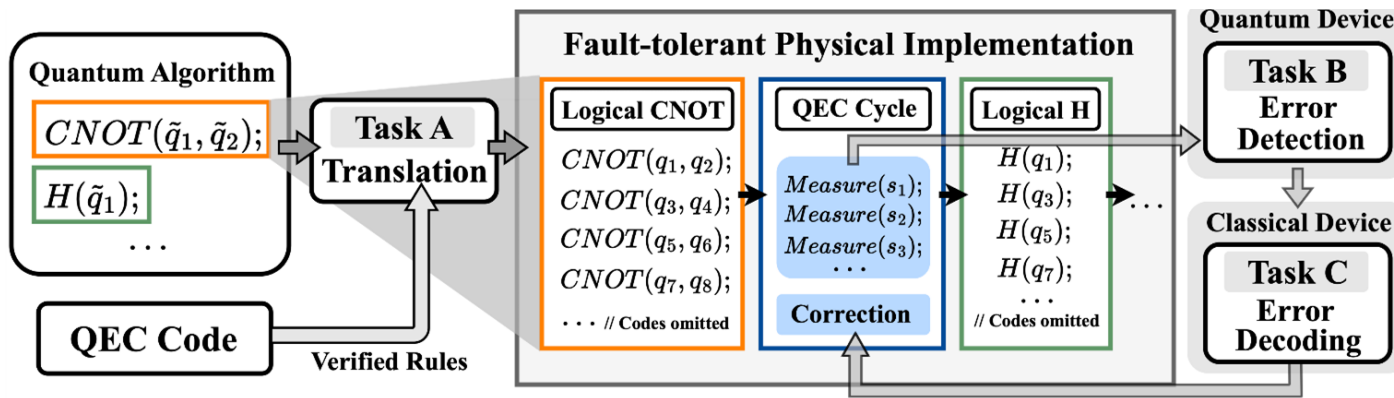
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Challenges:

- Generate fault-tolerant quantum programs
- Prove their correctness
- Produce a unified framework for different error-correction codes

Scientific Impact:

- A **language** for fault-tolerant quantum computing, along with abstractions and invariants
- An **error model** that is amenable to formal methods

Solution:

- Automate and verify the compiler
- Synthesize a verifiable error detector
- Quantitatively verify the error decoder

Broader Impact and Broader Participation:

- Enable trust-worthy quantum computing
- Work with IBM Qiskit and Amazon Braket
- Weave into existing courses
- Mentor students from underrepresented groups

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