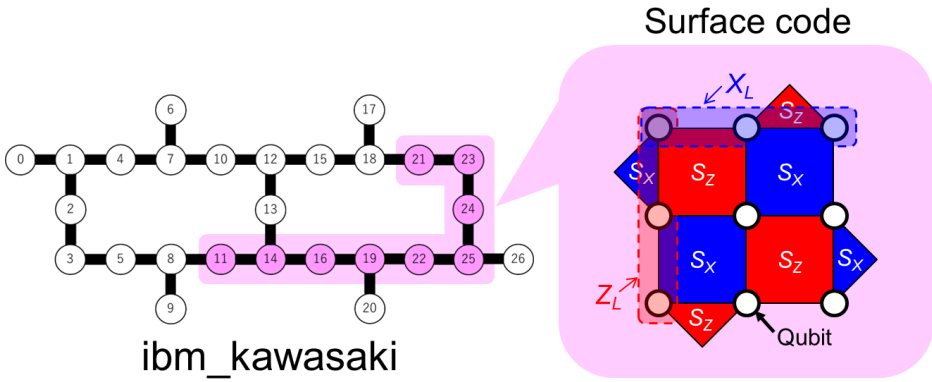
株式会社　東芝

研究概要 ①

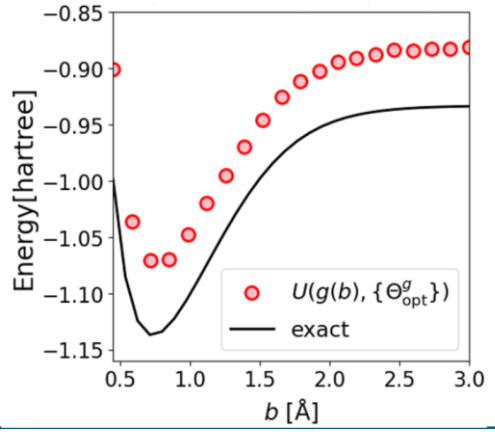
表面符号で符号化された状態を１次元量子ビット配列で誤り耐性的に生成する方法を提案し、ibm_kawasakiを用いてその原理実証実験に成功した。また、ZZ結合によるエラーをキャンセルする手法も提案し、その効果を実験で実証した。



Hayato Goto, Yinghao Ho, and Taro Kanao
Measurement-free fault-tolerant logical-zero-state encoding of the distance-three nine-qubit surface code in a one-dimensional qubit array, Phys. Rev. Research 5, 043137 (2023)

研究概要 ②

分子の内部座標値を指定すると量子化学計算に基づくポテンシャルエネルギーを推定できる量子回路学習モデルを構築した。
分子の電子数を保存するように量子回路を構成することで、パラメータの数を削減し、学習コスト低減を図った。
ibm_kawasakiを用いて水素分子のエネルギー推定を行い、ノイズ影響の評価を行った。

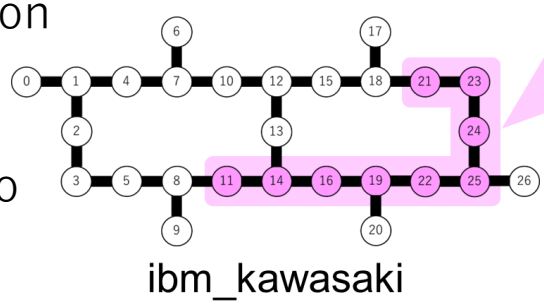


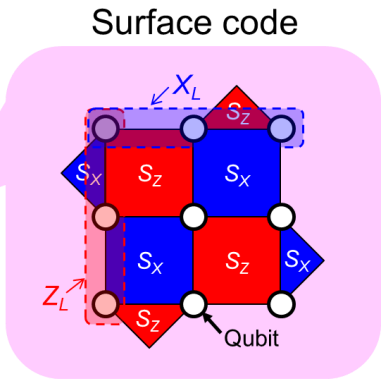
Y. Nishida and F. Aiga
Applications of quantum surrogate circuit using particle-number-conserving state on quantum chemical calculations, APL Quantum 1, 026102 (2024)

Toshiba Corporation

Abstract ①

We proposed a fault-tolerant state-preparation method for the surface code with a one-dimensional qubit array, and experimentally demonstrated it using ibm_kawasaki. We also proposed and demonstrated our ZZ-coupling error cancellation method.

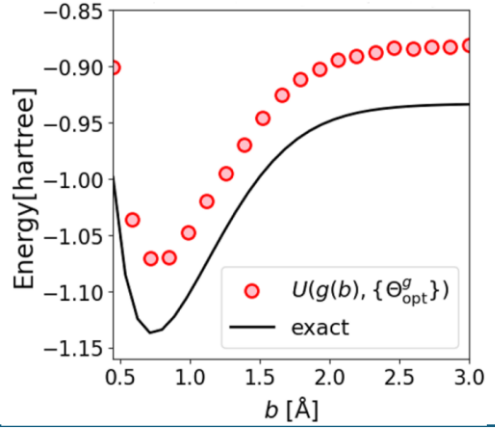




Hayato Goto, Yinghao Ho, and Taro Kanao
Measurement-free fault-tolerant logical-zero-state encoding of the distance-three nine-qubit surface code in a one-dimensional qubit array, Phys. Rev. Research 5, 043137 (2023)

Abstract ②

We constructed a quantum circuit learning model that can infer potential energy based on quantum chemical calculations by specifying the internal coordinate values of molecules. By configuring the quantum circuit to preserve the number of electrons in the molecule, the number of parameters was reduced, and the learning cost was lowered. Using ibm_kawasaki, we estimated the energy of the hydrogen molecule and evaluated the effect of noise.



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