Quantum Algorithms

Solving a Non-Linear Partial Differential Equation

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Introduction

There have already been a lot of papers and research that has gone into the solving of linear partial differential equations (PDEs) using quantum computer for an exponential speedup. In the case of linear PDEs quantum algorithms are very well suited and reasonably simple to implement. However, there is somme added complexity for non-linear PDEs. The Navier-Stokes equations are a set of non-linear PDEs that describe the motion of fluid. "They are used in many fields such as weather forecasting, aircraft design and determining the magneto-hydrodynamics of plasmas in space and in nuclear fission" (2). "The Navier-Stokes equations are notoriously difficult to solve on classical computers at large Reynolds numbers" (3) and so a quantum algorithm could offer a significant speedup.

Problem Definition

Objectives

Conclusion

Bibliography

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3. ArXiv. (2024). Quantum Computing of Fluid Dynamics Using the Hydrodynamic Schrödinger Equation. Available at: https://journals.aps.org/prresearch/abstract/10.1103/PhysRevResearch.5.033182