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Preliminary Lattice Boltzmann Method Simulation using Intel® Quantum SDK

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The present work is based on the research within the framework of cooperation between Intel Labs and Deggendorf Institute of Technology, since the Intel® Quantum SDK (Software Development Kit) has recently released. Transport phenomena e.g. heat transfer and mass transfer are nowadays the most challenging unsolved problems in computational physics due to the inherent nature of fluid complexity. As the revolutionary technology, quantum computing opens a grand new perspective for numerical simulation including the computational fluid dynamics (CFD). It is true that the current CFD algorithms based on the different scales (e.g. macroscopic or microscopic) need to be translated into quantum system. In the current work the quantum algorithms have been preliminarily implemented for fluid dynamics using the Intel Quantum SDK, one mesoscopic approach has been applied i.e. to solve the lattice Boltzmann equation. Taking the simplest transport phenomena as a starting point, the preliminary quantum simulation results have been validated with the analytical solution and the classical numerical simulation. The potential of quantum in simulating fluid will be discussed.

Significance

This is a highly innovative topic, that has not been researched in Europe yet but could have immeasurable impact on a range of subjects from our daily life like meteorology, materials, energy, pharmacology and others.

References

Experiment context, if any

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