CAS 741: Problem Statement
Commonality, Variability, and Implementation of Lattice Boltzmann Solvers

Peter Michalski
000653483

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Table 1: Revision History

Date	Developer(s)	Change
2018-12-17	P. Michalski	Initial Draft

Problem

The Lattice Boltzmann methods (LBM) are a powerful technique to simulate multiphase and multicomponent fluid dynamics using a mesoscopic distribution function. The LBM have grown in popularity since its inception and there are now several open-source implementations of LBM for simulating fluid dynamics over a range of parameters. These implementations are of varying complexity and they offer many distinct parameter options, which can be challenging for the user.

Solution

This project will conduct a commonality analysis for the aforementioned family of LBM solvers, and will attempt to distinguish key solver functionality. A new solver will be built that will include the most important features found in the commonality analysis, providing the user with a basic, easy to use, implementation of LBM.

Context

Environment

The solver will be compatible with KDE neon 5.16 (Ubuntu 18.04 LTS) and macOS 10.13.6. Compatibility with other operating systems will not be guaranteed.

Stakeholders

Stakeholders include:

- Dr. Spencer Smith
- Dr. Jacques Carette
- Ao Dong
- Other members of my M.Eng project team
- Individuals studying or working with Lattice Boltzmann implementations