Project Notes - Solution Descriptions

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1 List of LBM solutions

1. aromanro/LatticeBoltzmann
   https://github.com/aromanro/LatticeBoltzmann
   Found from list at https://github.com/topics/lattice-boltzmann
   A 2D Lattice Boltzmann program

2. Atruszkowska/LBM_MATLAB
   https://github.com/atruszkowska/LBM_MATLAB
   Found from list at https://github.com/topics/lattice-boltzmann
   MPI-style parallelized Shan and Chen LBM with multiscale modeling extension

3. ch4-project
   https://github.com/SoftwareImpacts/SIMPAC-2019-1
   Found using Google search.
   Eulerian-Lagrangian fluid dynamics platform A general purpose Lattice-Boltzmann code for fluid-dynamics simulations. It includes : fluid dynamics (with several volume forcing terms for Channel flow, Homogeneous Isotropic Turbulence, buoyancy) temperature dynamics (advection, diffusion , sink/source or reaction terms) phase change (enthalpy formulation for solid/liquid systems) scalar transport (same functionalities as temperature) lagrangian dynamics (tracers, heavy/light and active point-like particles; non-shperical Jeffery rotation, gyrotaxis) large eddy simulation (Smagorinsky, Shear Improved Samgorinsky with Kalman Filter)

4. CUDA-LBM-simulator
   https://github.com/henryfriedlander/CUDA-LBM-simulator
   Found from list at https://github.com/topics/lattice-boltzmann
   This is a Lattice-Boltzmann simulation using CUDA GPU graphics optimization.

5. CudneLB (TCLB)
   https://github.com/CFD-GO/TCLB
   Found from list at https://github.com/topics/lattice-boltzmann
   CudneLB is a MPI+CUDA or MPI+CPU high-performance CFD simulation code, based on Lattice Boltzmann Method.

6. DL_Meso
   https://www.scd.stfc.ac.uk/Pages/DL_MESO.aspx
   Found using Google search.
   DL_MESO is a general purpose mesoscale simulation package developed by Michael Seaton for CCP5 and UKCOMES under a grant provided by EPSRC. It is written in Fortran 2003 and C++ and supports both Lattice Boltzmann Equation (LBE) and Dissipative Particle Dynamics (DPD) methods. It is supplied with its own Java-based Graphical User Interface (GUI) and is capable of both serial and parallel execution.

7. ESPResSo
   http://espressomd.org/html/doc/index.html
   Found from list at https://github.com/topics/lattice-boltzmann
   ESPResSo is a simulation package designed to perform Molecular Dynamics (MD) and Monte Carlo (MC) simulations. It is meant to be a universal tool for simulations of a variety of soft matter systems. It features a broad range of interaction potentials which opens up possibilities for performing simulations using models with different levels of coarse-graining. It also includes modern and efficient algorithms for treatment of Electrostatics (P3M, MMM-type algorithms, constant potential simulations, dielectric interfaces,), hydrodynamic interactions (DPD, Lattice-Boltzmann), and magnetic interactions, only to name a few. It is designed to exploit the capabilities of parallel computational environments. The program is being continuously extended to keep the pace with current developments both in the algorithms and software.

8. ESPResSo++
   http://www.espresso-pp.de/
   Found from list at https://github.com/topics/lattice-boltzmann
   ESPResSo++ is a software package for the scientific simulation and analysis of coarse-grained atomistic or bead-spring models as they are used in soft matter research.
   ESPResSo++ has a modern C++ core and flexible Python user interface. ESPResSo and ESPResSo++ have common roots however their development is independent and they are different software packages.
   ESPResSo++ is free, open-source software published under the GNU General Public License (GPL).

9. firesim
   https://github.com/kynan/firesim
   Found using Google search.
   Lattice Boltzmann Method (LBM) fluid solver driving a particle engine for the simulation and real-time visualization of fire

10. fvLBM
    https://github.com/zhulianhua/fvLBM
    Found using Google search.
    finite volume lattice Boltzmann method

11. HemeLB
    https://github.com/UCL/hemelb
    Found using Google search.
    A software pipeline that simulates the blood flow through a stent (or other flow diverting device) inserted in a patients brain.

12. JFlowSim
    https://github.com/ChristianFJanssen/jflowsim
    Found from list at https://github.com/topics/lattice-boltzmann

jFlowSim is an interactive, thread-parallel Lattice Boltzmann solver in two dimensions.

13. laboetie
    https://github.com/maxlevesque/laboetie
    Found from list at https://github.com/topics/lattice-boltzmann
    laboetie is a computational fluid dynamics code for chemical applications. It uses the Lattice-Boltzmann algorithm.

14. LatBo.jl
    https://github.com/UCL/LatBo.jl
    Found using Google search.
    Lattice-Boltzmann implementation in Julia

15. lettuce
    https://github.com/Olllom/lettuce
    Found using Google search.
    GPU-acclerated Lattice Boltzmann in Python

16. LB2D_Prime
    http://faculty.fiu.edu/ sukopm/LBnD_Prime/LBnD_Prime.html
    Found using Google search.
    LB2D_Prime is a lattice Boltzmann (LB) code capable of simulating single and multi-phase flows and solute/heat transport in geometrically complex domains.

17. LB3D
    http://ccs.chem.ucl.ac.uk/lb3d
    Found using Google search.
    A parallel implementation of the Lattice-Boltzmann method for simulation of interacting amphiphilic fluids. LB3D provides functionality to simulate three-dimensional simple, binary oil/water and ternary oil/water/amphiphile fluids using the Shan-Chen model for binary fluid interactions.

18. LBDEMcoupling-public
    https://github.com/ParticulateFlow/LBDEMcoupling-public
    Found using Google search.
    Coupling between the Lattice-Boltzmann code Palabos and the DEM code LIGGGHTS

19. LBSim
    https://github.com/noirb/lbsim
    Found using Google search.
    A small and simple Lattice-Boltzmann Method fluid simulator supporting complex boundaries.

20. Limbes
    https://code.google.com/archive/p/limbes/
    Found using Google search.

Open source (GPL) code in 2D based on Gauss-Hermite quadrature, parallel (openmp), fortran 90. LIMBES is the recursive acronym for LIMBES Is May be a Boltzmann Equation Solver. Version 1.0 solves numerically by a Lattice Boltzmann like method the BGK-Boltzmann equation for gas in two dimensions.

21. listLBM
    https://github.com/sorush-khajepor/listLBM
    Found from list at https://github.com/topics/lattice-boltzmann
    ListLBM is a sparse lattice Boltzmann solver for multiphase flow in porous media

22. LUMA
    https://github.com/ElsevierSoftwareX/SOFTX-D-18-00007
    Found from list at https://github.com/topics/lattice-boltzmann
    LUMA: A many-core, FluidStructure Interaction solver based on the Lattice-Boltzmann Method

23. MP-LABS
    https://github.com/carlosrosales/mplabs
    Found using Google search.
    MP-LABS is a suite of numerical simulation tools for multiphase flows based on the free energy Lattice Boltzmann Method (LBM). The code allows for the simulation of quasi-incompressible two-phase flows, and uses multiphase models that allow for large density ratios. MP-LABS provides implementations that use periodic boundary conditions, but it is written in a way that allows for easy inclusion of different boundary conditions. The output from MP-LABS is in plain ASCII and VTK format, and can be analyzed using other Open Source tools such as Gnuplot and Paraview.

    The objective of the MP-LABS project is to provide a core set of routines that are well documented, highly portable, and have proven to perform well in a variety of systems. The source code is written in Fortran 90 and MPI and uses separate subroutines for most tasks in order to make modifications easier.

24. Openlb
    https://www.openlb.net/
    Found from list at https://github.com/topics/lattice-boltzmann
    The OpenLB project provides a C++ package for the implementation of lattice Boltzmann methods that is general enough to address a vast range of tansport problems, e.g. in computational fluid dynamics. The source code is publicly available and constructed in a well readable, modular way.

25. Palabos
    https://palabos.unige.ch/
    Found using Google search.
    The Palabos library is a framework for general-purpose computational

fluid dynamics (CFD), with a kernel based on the lattice Boltzmann (LB) method. It is used both as a research and an engineering tool: its programming interface is straightforward and makes it possible to set up fluid flow simulations with relative ease, or, if you are knowledgeable of the lattice Boltzmann method, to extend the library with your own models. Palabos stands for Parallel Lattice Boltzmann Solver. The librarys native programming interface in written in C++.

26. pyLBM
    https://github.com/pylbm/pylbm
    Found from list at https://github.com/topics/lattice-boltzmann
    pylbm is an all-in-one package for numerical simulations using Lattice Boltzmann solvers. This package gives all the tools to describe your lattice Boltzmann scheme in 1D, 2D and 3D problems.

27. Sailfish
    https://github.com/sailfish-team/sailfish
    Found using Google search.
    Lattice Boltzmann (LBM) simulation package for GPUs (CUDA, OpenCL)

28. siramirsaman/LBM
    https://github.com/siramirsaman/LBM
    Found from list at https://github.com/topics/lattice-boltzmann
    Lattice Boltzmann Method Implementation in MATLAB for Curved Boundaries

29. SunlightLB
    http://sunlightlb.sourceforge.net/
    Found using Google search.
    SunlightLB is an open-source 3D lattice Boltzmann code which can be used to solve a variety of hydrodynamics problems, including passive scalar transport problems.

30. Taxila-LBM
    https://github.com/ecoon/Taxila-LBM
    Found using Google search.
    Taxila LBM is a parallel implementation of the Lattice Boltzmann Method for simulation of flow in porous and geometrically complex media.

31. loliverhennigh / Lattice-Boltzmann-fluid-flow-in-Tensorflow
    https://github.com/loliverhennigh/Lattice-Boltzmann-fluid-flow-in-Tensorflow
    Found using Google search.
    A Lattice Boltzmann fluid flow simulation written in Tensorflow.

32. turbulent_lbm_multigpu
    https://github.com/arashb/turbulent_lbm_multigpu
    Found using Google search.
    Lattice Boltzmann simulation of turbulent fluid flow on GPU Cluster

33. waLBerla
    https://www.walberla.net/
    Found using Google search.
    waLBerla uses the lattice Boltzmann method (LBM), which is an alternative to classical Navier-Stokes solvers for computational fluid dynamics simulations. All of the common LBM collision models are implemented (SRT, TRT, MRT). Additionally, a coupling to the rigid body physics engine pe is available.

34. wlb
    https://github.com/weierstrass/wlb
    Found using Google search.
    A Lattice-Boltzmann code for solving coupled equations in electrohydrodynamics. Three collision operators are implemented for the (incompressible) Navier-Stokes, Nernst-Planck (advection-diffusion) and Poission's equation for electrostatics respectively. Various implementations of Dirichlet/Neumann boundary conditions are also available. The code deals (so far) only with 2D systems. This code is part of a master thesis project carried out at Chalmers University, Gothenburg.

35. Zmhhaha/LBM-Cplusplus-A.A.Mohamad
    https://github.com/zmhhaha/LBM-Cplusplus-A.A.Mohamad
    Found from list at https://github.com/topics/lattice-boltzmann
    The C++ version code of "Lattice Boltzmann Method Fundamentals and Engineering Applications with Computer Codes".