About simulation techniques for fluid problems

JK&OK

started: 20/08/2016   **current:** 02/09/2016

Abstract

The conversation will be towards the development of basics regarding the development of simulations for fluid dynamical problems in any medium.

1   Conversations on computational fluid dynamics

JK: Is there any method other than dicreatization techniques for simulation?
OK: Finite–different, finite–volume, finite–element discretizations [1], [2], [3].

JK: So Far we discussed some aspects of fluid simulations and that can be summarised as follows.

1.1   Hydrodynamic fluid simulation

A. Equation of motion [7].
B. Equation of continuity. [7]
C. Navier–Stokes equation. [6], [9]
D. Poisson equation. [6]
Ref: [6], [7], [8],

1.2   Kinetic simulation

A. Hydrodynamical with inclusion of distribution function (Yukawa, Coulomb).
Ref: [8]

1.3   Molecular dynamics simulation

A. Second law of Newton with potential of interaction.
Ref: [5], [4]

JK:
1. How to develop a parallel 3d finite code for a fluid analytical model like Gondarenko Gujdar 2006 JGR.
OK: Refs?
2. How to develop time code run of Fig1-3 of avinash 2003 prl in colour line like fig 1 of Gondarenko-Gujdar 2006 JGR.
OK: Refs? [6, p. 280]

1

References

[1] Finite–difference method discretization. Lecture notes.

[2] Finite–elements method discretization. Lecture notes.

[3] Finite–volume method discretization. Lecture notes.

[4] Molecular dynamics for low temperature plasma-surface interaction studies. link.

[5] CharlesMatthews BenLeimkuhler. *Molecular Dynamics*. Springer, 2015.

[6] Sidi Mahmoud Kaber Marie Postel Ionut Danaila, Pascal Joly. *An Introduction to Scientific Computing: Twelve Computational Projects Solved with MATLAB*. Springer, 2006.

[7] Randall J. LeVeque. *Finite Volume Methods for Hyperbolic Problems*. Cambridge University Press, 2004.

[8] Alexander S. Lipatov. *The Hybrid Multiscale Simulation Technology*. Springer, 2002.

[9] David W.Zingg Thomas H.Pulliam. *Fundamental Algorithms in Computational Fluid Dynamics*. Springer, 2014.

Contents