

# About simulation techniques for fluid problems

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## 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 discretization 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]

jk github demo dated 6 9 2016

## 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.

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