

Notes for Simulations using Particles

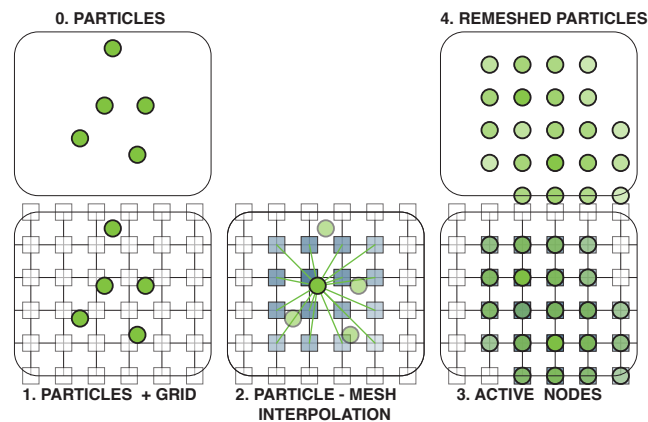
Professor Petros Koumoutsakos
Shilpa Khatri

Particle Mesh Simulations II

Topics:

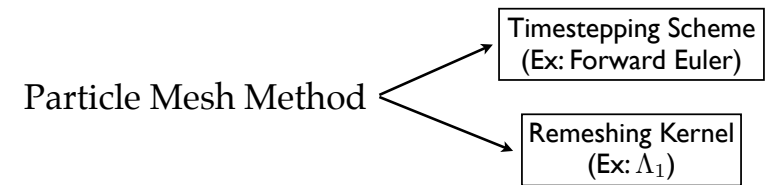
- Review of Remeshing
- Remeshing in last weeks homework
- Review of Remeshing Kernels
- Particle Mesh Simulations and Finite Difference Methods

Particle Mesh Methods

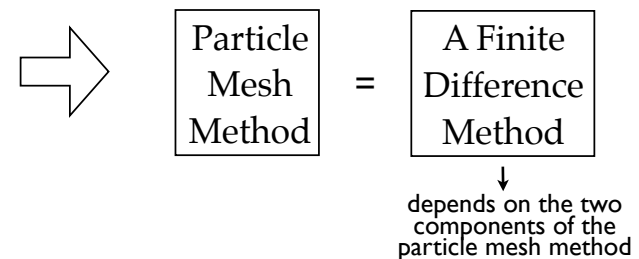


Reference: P. Koumoutsakos, G.-H. Cottet, and D. Rossinelli, Flow Simulations Using Particles, Bridging Computer Graphics and CFD, 2009

Relationship with Finite Difference Methods



If remeshing is done every timestep:



Relationship with Finite Difference Methods

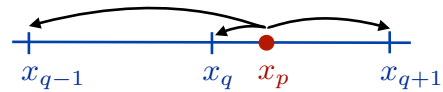
Linear Advection: $u_t + au_x = 0$

Lagrangian form: $\frac{dx}{dt} = a, \quad \frac{du}{dt} = 0$

Particle Mesh Method:

Use Forward Euler to solve $\frac{dx}{dt} = a$

Use central remeshing (Λ_2 kernel):



It can be shown that this method (when remeshing every timestep) is just the Lax-Wendroff scheme in finite differences.