

Multiphase Flows – WS 2021/22

Problem Session 5 – **Solution:** Interface Tracking (1/3)



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Problem Session 5: Interface Tracking (I/3)

Problem I: Solution

Discretization of density advection equation:

$$\begin{aligned}\frac{\partial \rho}{\partial t} &= -\nabla \cdot (\rho \mathbf{u}) + \mu_0 \nabla^2 \rho = -\frac{\partial \rho u}{\partial x} - \frac{\partial \rho v}{\partial y} + \mu_0 \left(\frac{\partial^2 \rho}{\partial x^2} + \frac{\partial^2 \rho}{\partial y^2} \right) \\ \Rightarrow \frac{\rho_{i,j}^{n+1} - \rho_{i,j}^n}{\Delta t} &= \\ &= -\frac{1}{\Delta x} \left(u_{i+\frac{1}{2},j} \frac{\rho_{i+1,j} + \rho_{i,j}}{2} - u_{i-\frac{1}{2},j} \frac{\rho_{i-1,j} + \rho_{i,j}}{2} \right) - \frac{1}{\Delta y} \left(u_{i,j+\frac{1}{2}} \frac{\rho_{i,j+1} + \rho_{i,j}}{2} - u_{i,j-\frac{1}{2}} \frac{\rho_{i,j-1} + \rho_{i,j}}{2} \right) \\ &\quad + \frac{\mu_0}{\Delta x^2} (\rho_{i+1,j} - 2\rho_{i,j} + \rho_{i-1,j}) + \frac{\mu_0}{\Delta y^2} (\rho_{i,j+1} - 2\rho_{i,j} + \rho_{i,j-1})\end{aligned}$$

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Problems 2 & 3: Solution

The complete code has been uploaded to Moodle.



Thank you for your attention

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