Institut für Analysis und Numerik
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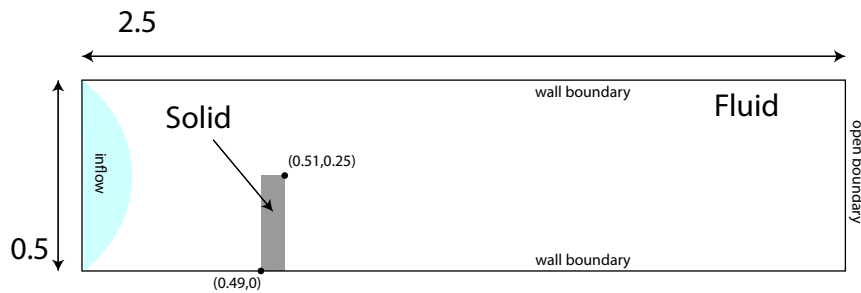Thomas Richter

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Exercise 3 for the lecture Fluid-structure Interactions
Summer 2025

Task 1

On the domain

compute the fluid-structure interaction problem. On the left boundary, the inflow condition is given as

$$v_{in}(x, y) = 1.5 v_{max} \frac{y(0.5 - y)}{0.25^2}.$$

Start with $v_{max} = 0.2$ and use the material parameters

$$\rho_f = \rho_s = 1000, \quad \nu_f = 0.001, \quad \mu_s = 0.5 \cdot 10^6, \quad \nu_s = 0.4.$$

- Solve the problem for $t \in [0, 5]$ and plot the x- and y-deformation in the point $(0.5, 0.25)$

- Modify mesh size and time step size until you have the impression that the solution is not significantly changing. Document your decision.

- Change the densities to

$$\rho_f = 100, \quad \rho_s = 10000$$

and

$$\rho_f = 10000, \quad \rho_s = 100$$

and study the dynamics of the interaction.