

Lab 5

These are just exercises, do not hand them in as homework.

1. Subversion:

- (a) Check out the shared test repository, read the text file and follow the instructions.
- (b) Check out your own repository and start using it for your project.

2. step-26:

- (a) Read documentation.
- (b) Now work from the modified step-26 from the shared repository.
- (c) Run it and visualize the result in visit. Pick the pseudocolor scale as fixed from -0.01 to 0.01.
- (d) Implement the correct boundary conditions and right hand side to get the solution:

$$u(x, y, t) = \sin(\pi x) + 5 \cos(\pi y) \sin(10t)$$

with $t \in [0, 1]$.

- (e) Make sure you start with the correct initial condition $u(x, y, 0)$.
- (f) Let it run and look at the solution.
- (g) Fix the problem that we are not reaching the final time T exactly (what is a robust way to do this?).
- (h) Implement a way to loop over different time step sizes ($1/4, 1/8, \dots, 1/1024$) in one run.
- (i) Verify that the temporal error is $O(\tau)$ for implicit Euler and $O(\tau^2)$ for Crank-Nicolson.
- (j) Verify that the spacial error is $O(h^2)$.