Project 4
SF2568 Program construction in C++ for Scientific Computing

June 28, 2019

In this excercise you will construct basic operators for enabling the solution of partial differential equations. The necessary structured grids shall be generated using your `Domain` class from Project 3.

Task 1 Redesign your class according to the hints given in the lecture! In particular, you may consider smart pointers.

Task 2 Implement a class `GFkt` for grid functions defined on a certain discretized domain! Besides the standard operations (addition, multiplication by a scalar etc) implement the discrete differential operators $\partial/\partial x, \partial/\partial y$ and the Laplacian Δ.

Task 3 Consider the function

$$u(x,y) = \sin((x/10)^2)\cos(x/10) + y.$$

Generate a grid on a the domain as in Project 3. Diskretize u using this grid and compute the differential operators developed in Task 2. Store the result in new objects. Write them to a file, and use Matlab to visualize the result, the exact derivatives, and the error.

The programming exercises should be done individually, or in groups of two. Hand in a report containing:

- Comments and explanations that you think are necessary for understanding your program.

- A picture of the generated grid functions, using approximately 50×20 grid points.

- Printout of the source code.

Additionally, submit all of your source code!