Project 1 – 2017-08-30

FMNN25: Advanced Numerical Algorithms in Python

Claus Führer, Centre for Mathematical Sciences - Numerical Analysis

This describes the first bigger programming project in the course, devoted to splines and the deBoor algorithm.

Be prepared to have this project completed with all aspects latest on Tuesday, September 15. Note that this project might get some additional tasks next week. You are supposed to work in groups by max four.

This assignment has 5 tasks.

Task 1

Design a spline class in Python. Its main purpose should be for curve design in 2D. Beside this, it might be used for interpolation purposes also.

Task 2

Provide the class with an `__init__`, `__call__` method based on de Boors algorithm, and a `plot` method which optionally plots also the control polygon and the de Boor points.

Task 3

Write a function that takes a knot sequence $\{u_i\}_{i=0}^{K}$ and an index j as input and which returns a Python function to evaluate the j:th B-spline basis function N_j^3.

Task 4

Write tests for unitest or nosetests. Test among others if $s(u) = \sum d_j N_j^3(u)$ holds, where $s(u)$ is the evaluation of the spline using de Boor's algorithm.

Task 5

Discuss the design of your spline class and a possible polynomial class in connection with attribute and method inheritance.

Lycka till!