Institute of Scientific Computing

Technical University Braunschweig

Summer Term 2018

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Advanced Methods for ODE and DAE:
Assignment 1

This is to become familiar with some concepts of object-oriented programming.

The due date is 17. of April. It is still under consideration how to hand in code, we are thinking of establishing an svn system.

It is recommended to have the matlab part finished until 10.4., to be able to see some of the problems.

Exercise 1: **(16 points)**

   (a) Implement the general explicit Runge-Kutta-method in Matlab. Parametrize it with parameters of Euler-Forward and Heuns method. Test both methods (this means write a test) with

$$\dot{x} = -x$$

   . (8 points)

   (b) Make a convergence plot in stepwidth h for both methods. (4 points)

   (c) Provide this for vector valued problems (a scalar is a vector, so vector-valued implementation includes the scalar one). (4 points)

Exercise 2: **(16 points)**

   Now do the same in python (include numpy, use numpy.array as data type). The RK method should be a class, Euler-Forward and Heuns method should be instantiated from it. It is recommended to use eclipse. If desired, a small tutorial can be marked in the week 9. - 13. 4..