Otto-Von-Guericke-University-Magdeburg   Summer Term 2015
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Model Reduction of Dynamical Systems - 7

Deadline for homework: 21/07/2015

Task: 1   (PMOR using IRKA)

Consider the linear parametric system obtained after finite element discretization of the 2D-axisymmetric model:

$$E\dot{x} = Ax - h_t A_t x + B,$$
$$y = Cx. \tag{1}$$

Implement the parametric model order reduction (PMOR) using IRKA as discussed in the course to reduce the system (1). Use the data available on the course homepage as thermal.mat. Choose $r = 10$ and $l = 5$, where l is the number of parameter samples. Plot the output of the original linear parametric system for four different values of h_t, that is $h_{t1} = 100$, $h_{t2} = 500$, $h_{t3} = 1000$ and $h_{t4} = 1 \times 10^9$. The plots of the output for the original parametric system for the four parameter values are shown in Figure 1. Compare these plots with those obtained from the reduced system. Use MATLAB ODE15s solver to solve the original and the reduced linear parametric systems.
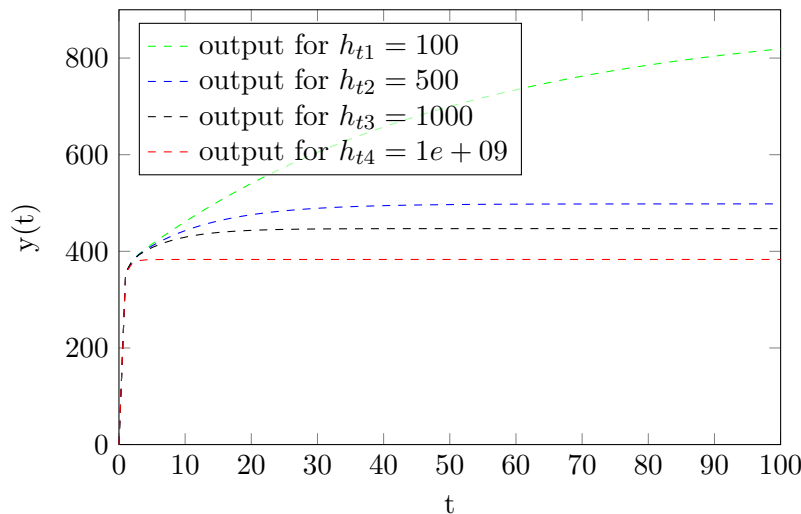

Figure 1: Output response of the linear parametric system for different parameter values

Task: 2   (PMOR using POD)

Implement the proper orthogonal decomposition (POD) method discussed in the course to construct a reduced linear parametric system for the system in (1). Choose 5 samples of the parameter h_t and corresponding to each sample, use 10 snapshots of the original state vector. With these settings construct a reduced model of size $r = 20$. Analogous to the first task, compare the results for the original and the reduced linear parameteric models.

Send your routines to *imahmad@mpi-magdeburg.mpg.de*. The filename should include your name and the corresponding exercise sheet number as well as the exercise number, e.g., name-hw1e6. In case of several files please hand in a compressed file. Moreover, please print the source code of your routine and hand it in together with the other exercises.