Model Reduction of Dynamical Systems - 4

Deadline for homework: 09/06/2015

Task: 1   (Model order reduction by the Arnoldi iteration)

Write a MATLAB routine which reads in an LTI realization (A, B, C, D), computes an orthogonal basis $V = [v_1, \ldots, v_k]$ for the Krylov subspace $\mathcal{K}_k(A, B)$ by means of the Arnoldi iteration discussed in the course and constructs a reduced-order realization as

$$\hat{A} = V^T A V, \ \hat{B} = V^T B, \ \hat{C} = CV, \ \hat{D} = D.$$

Again use *CDPlayer.mat* and evaluate the transfer function

$$H(i\omega) = C(i\omega I - A)^{-1} B + D$$

for original and reduced-order model similar to the first task. Test several values of k and interpret the results.

Task: 2   (The iterative rational Krylov algorithm)

Implement the iterative rational Krylov algorithm (IRKA) discussed in the course for a SISO linear time invariant system. Use the model of the beam available on the course homepage as *beam.mat*. Make the initial selection of the interpolation points random and closed under conjugation. Evaluate the transfer function for the original $H(i\omega)$ and the reduced-order hermite interpolant $H_r(i\omega)$, similar to Task 1 and 2.

Send your routines to *imahmad@mpi-magdeburg.mpg.de*. The filename should include your name and the corresponding homework sheet number as well as the task number, e.g., name-hw1t2. In case of several files please hand in a compressed file. Moreover, please print the source code of your routine and hand it in the exercise class.