APPLIED MATHEMATICS COLLOQUIUM

MODEL REDUCTION OF LARGE DYNAMICAL SYSTEMS

PAUL VAN DOOREN
CESAME, Université Catholique de Louvain
Louvain-la-Neuve, Belgium

ABSTRACT:

We describe model reduction techniques for large scale dynamical systems, modeled via generalized state-space systems

$$\begin{cases} E\dot{x}(t) = Ax(t) + Bu(t) \\ y(t) = Cx(t) + Du(t), \end{cases}$$

with input $u(t) \in \Re^m$, state $x(t) \in \Re^N$ and output $y(t) \in \Re^p$. These models arise from the discretization of continuum problems and correspond to sparse systems of equations $\{E, A, B, C, D\}$. The state dimension N is typically very large, while m and p are usually reasonably small. Although the numerical simulation of such systems may still be viable for large state dimensions N, most control problems of such systems are of such high complexity that they require model reduction techniques, i.e. techniques that construct a lower order model via a projection on a state space of lower dimension. We survey such techniques and discuss extensions to interconnected and mechanical systems as well as time-varying system models.

Monday, March 29, 2004
4:15 p.m.

M.I.T. Room 2-105

Refreshments will be served at 3:30 PM in Room 2-349.

http://www-math.mit.edu/amc/spring04

Department of Mathematics
Massachusetts Institute of Technology
Cambridge, MA 02139