



CSC Seminar

SPEAKER

Jennifer Przybilla

TITLE

An Adaptive Scheme for the Optimization of Damping Positions by Decoupling Controllability Spaces in Vibrational Systems

ABSTRACT

In this work, the problem of optimizing damper positions in vibrational systems is investigated. The objective is to determine the positions of external dampers in such a way that the influence of the input on the output is minimized. The energy response serves as an optimization criterion, whose computation involves solving Lyapunov equations. Hence, in order to find the best positions, many of these equations need to be solved, and so the minimization process can have a high computational cost.

To accelerate the process of finding the optimal positions, we propose a new reduction method. Our algorithm generates a basis spanning an approximation to the solution space of the Lyapunov equations for all possible positions of the dampers. We derive an adaptive scheme that generates the reduced solution space by adding the subspaces of interest, and then we define the corresponding reduced optimization problem that is solvable in reasonable amount of time. We decouple the solution spaces of the problem to obtain a space that corresponds to the system without external dampers and serves as a starting point for the reduction of the optimization problem. In addition, we derive spaces corresponding to the different damper positions that are used to expand the reduced basis if needed. Our new technique produces a reduced optimization problem of significantly smaller dimension that is faster to solve than the original problem, which we illustrate with some numerical examples.

Tuesday, February 21, 2023 at 2 pm
seminar room Prigogine