ALGORITHMS FOR QUADRATIC EIGENVALUE PROBLEMS

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Modal acceleration methods for linear transient problems will be addressed. An important preliminary step is the computation of hundreds of modes of a quadratic eigenvalue problem on a distributed memory platform. Problems with symmetric positive definite (SPD) mass, positive semidefinite damping, and symmetric positive semidefinite (SPSD) stiffness matrices will be considered. The methods will be evaluated on structures problems (SPD damping) and certain coupled structure - acoustics problems (nonsymmetric damping). A popular indefinite formulation of the structure-acoustics problems will be carefully studied. Modal truncation based on biorthogonality in a first order formulation will be compared to singular value decomposition based truncation. Formulations of the eigenvalue problem will be compared for their compatibility with scalable linear solvers. In one formulation the shifted quadratic problem is solved by shifting away from the spectrum. The linear systems are SPD for structures problems but are either nonsymmetric or indefinite for these structure-acoustic problems. In another formulation the rigid body modes are deflated and there is no shift. Established scalable linear solvers for SPSD linear systems are leveraged. On the other hand, deflation is not trivial.

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