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On the Generalized Modal Analysis of Time-Dependent Problems for Quasi-Symmetric Complex Systems

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An algorithm for the solution of non-linear, complex-symmetric eigenvalue problems has been already developed as part of a generalized mode superposition technique for the analysis of the dynamic behavior of an elastic body under general boundary and loading conditions, also including viscous damping, for which cubic approximation of the eigenvalues is demonstrated (N. A. Dumont, IJNME Vol 71, 1534-1568, 2007). The only drawback of this formulation is that arriving at the frequency power series with symmetric coefficient matrices is extremely time-consuming (except for the trivial case of framed structures). The issue of constructing and solving a quasi-symmetric, generalized eigenvalue problem is investigated in this paper, both in terms of the underlying linear algebra theory and as concerning convergence rate of the algorithm and computational effort. The formulation is developed in the context of a variationally-based, simplified boundary element method applicable to large-scale problems. Some illustrative numerical examples are also presented.

Keywords: Boundary elements, Time-dependent problems, Variational methods, Generalized modal analysis, Quasi-symmetric problems.