

Smorgasbord of Issues in Structural Dynamics

by

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Abstract

We review briefly some interesting—and at times puzzling—problems in Structural Dynamics. Without getting into the narrow details, we shall present a clear overview of concepts involved as well as their technical significance. In particular—and time permitting—we shall elaborate briefly on each of the following concepts:

1. Numerical evaluation of the Laplace transform. The simple algorithm presented allows accurate evaluation of the response of both discrete and continuous systems in the frequency domain, and whether or not the systems have damping. Emphasis on applications.
2. Normalized modes without orthogonality conditions. We show briefly that the normalized modes are an intrinsic property of the eigenvalue problem, and at least in principle can be obtained directly from the solution of the eigenvalues and eigenvectors.
3. Zeros of transfer functions: It could be assumed a priori that these are intrinsic properties of dynamical systems as well as the degree of refinement of the discrete models, but we show that some rather drastic changes can take place with relatively minor changes in such models.
4. Non-classical modes of systems obeying the wave equation.
5. Can a discrete system ever replace a continuous system? That is, do examples of continuous systems exist having discrete (FE-type) counterparts such that the response to arbitrary dynamic loads will be identical in both the continuous and discrete systems? In general, the answer is no, but then again ...

Bio Sketch

Kausel earned his first professional degree in 1967 from the University of Chile, graduating as a Civil Engineer with "Distinción Unánime" (Summa Cum Laude), after which he joined the planning department at ENDESA, Chile's main electrical utility. In 1969, he travelled to Germany and carried out post-graduate studies at the Technical University of Darmstadt. A year later he moved to the United States and earned his Master of Science (1972) as well as Doctor of Science (1974) degrees from the Massachusetts Institute of Technology. Following graduation from MIT, Kausel worked in the industry at Stone and Webster Engineering Corporation in Boston until 1978, when he joined the faculty at MIT. He has remained there since and is currently a Professor of Civil and Environmental Engineering. Kausel also runs an engineering consulting firm specializing in structural mechanics, is a registered professional engineer in Massachusetts (R. No. 27976) and a member of the board of directors of Atlantica Yield, a publicly traded English-Spanish investment company focusing on renewable energy, power generation, electric transmission and water purification.