CAE Software for Structural Dynamics

As part of our expanded coverage of Computer Aided Engineering, S&V presents an overview of CAE software for structural dynamics currently available to experimentalists and analysts. Though it is neither a comprehensive review nor a competitive comparison, it is our hope that this "first look" will help introduce our readers to many of the CAE tools for this specific application that are available.

Listings are in alphabetical order by company name. This overview was compiled from information provided by selected software users, software suppliers, suppliers' websites and product literature, as well as the University of Illinois at Urbana-Champaign's National Center for Supercomputing Applications (NCSA) software website.

For complete information on any of the software products listed, we encourage you to go the web-sites of the suppliers and contact their sales representatives. It is not possible to cover all the many features and applications offered by these products in this brief overview. For example, ANSYS contains over 1 million lines of code and many pages of their web site are required to adequately describe the product.

Product Types

The programs for structural dynamics listed in the Software Tables are categorized into five main types.

1. **Finite Element Analysis.** FEA codes that solve a wide variety of engineering problems. They can model many different phenomena including the applications that are addressed in this review — analytical modal analysis, linkage of substructures, linear and nonlinear structural response and transient dynamic response.

2. **Experimental Modal Analysis.** Programs that use experimental forced or in-operation vibration measurements to generate a structural model in terms of modal parameters including mode shapes, natural frequencies and damping.

3. **Model Correlation and Updating Tools.** Software tools specifically designed to compare two structural models with the general intent of improving the dynamic performance & fidelity of a detailed analytical model so that it properly reflects observations made from verification experiments.

4. **Hybrid Experimental/Test Dynamic Modeling.** Software specifically designed to build a system dynamics model from multiple component models that may be either purely analytical or test-based.

5. **Other Dynamic Modeling Software.** Software that can build structural dynamics models and simulations using analytical methods other than finite elements.

User Focus

Software suppliers provide products that target almost every level of experience and application. The Software Tables include a column that categorizes each product's user focus into three classes:

1. User of CAE/Analysis software.
2. User of CAT (Computer-Aided Testing) software.
3. User of CAE/Testing software.

Pricing

The CAE Software Tables include a column of typical software contract. The pricing of CAE software by suppliers is a complex formula that may involve such factors as the number of seats needed by a given customer, the software modules that are ordered, the usage history, special library package arrangements, site licensing and maintenance contracts. Actual cost of a software package to a given customer may vary substantially from the prices listed in the tables and suppliers' sales representatives need to be consulted for actual licensing and pricing quotations.

Most of the suppliers of CAE software offer special student versions that are powerful packages but are limited to a maximum number of elements and nodes. These versions are substantially lower in cost compared to full-function versions, but are excellent for educational purposes.

Send comments and suggestions on this new software review service to: scott@SandV.com.

Company	Product Name	Type	Function	User Focus	US$/mo
ABAQUS, Inc. 401-727-4200 www.abaqus.com	ABAQUS	1	Static and dynamic stress analysis with linear and nonlinear material models, acoustics, coupled structural-acoustics	1	Contact Vendor
ALGOR, Inc. 412-967-2700 www.ALGOR.com	Professional MultiPhysics	1	Includes static stress analysis and mechanical event simulation (MES) with linear and nonlinear material models and linear dynamics	1	25,900+
	Professional Static/LM	1	Includes static stress analysis and is extensible to mechanical event simulation (MES) with linear and nonlinear material models and linear dynamics	1	5,490+
	ALGOR/NASTRAN	1	Includes a complete NASTRAN solution for static stress with linear material models, natural frequency (modal), critical buckling load, extensible to mechanical event simulation (MES) with linear and nonlinear material models and linear dynamics	1	8,040+
Altair Engineering 248-614-2400 www.altair.com	HyperWorks	1,3	Modeling, assembly, optimization visualization and process automation tools	1	—
ANSYS, Inc. 724-514-2931 www.ansys.com	ANSYS/Mechanical	1	Finite element analysis of linear and nonlinear structural response including modal analysis, full harmonic response, transient dynamic response, electro-magnetic and fluid flow problems	1	Contact Vendor
Peter A. Kjeer 800-202-2040 www.KKnem.com	Structural Dynamics Test Consultants	2	Suite of software that graphically guides users through serial modal and ODS tests	2	1,000-5,000
	Operational Modal Analysis	2	Response-only modal analysis, calculate resonance frequencies/damping/mode shapes without measuring input force	2	4,590-11,500

Cae Software For Structural Dynamics Sound And Vibration

Robert R. Redfield

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