

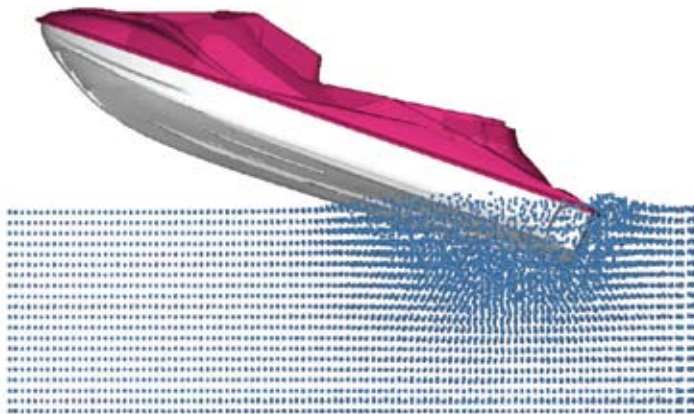
RADIOSS Is at the Center of HyperWorks Enterprise Simulation Platform

Next-generation solver uses the latest finite element technologies to increase analysis efficiency and accuracy.

by Margaret S. Gurney | Published November 12, 2008

The HyperWorks enterprise simulation solution suite from Altair Engineering, Inc. (Troy, MI) offers an open-systems philosophy for rapid design exploration, decision-making, and innovation. HyperWorks encompasses a tightly integrated suite of modeling, analysis, visualization, and data management system for linear,

Altair describes RADIOSS as “optimization ready,” by which it means that you can convert models into optimization problems easily and quickly. It also means that RADIOSS uses memory management techniques and efficient algorithms that can compute large models rapidly. Simulation results, Altair says, do not vary with number of processors used to solve explicit analysis problems, making RADIOSS highly parallelized and linearly scalable for additional computation efficiency.



Fluid-structure interaction in a recreational watercraft

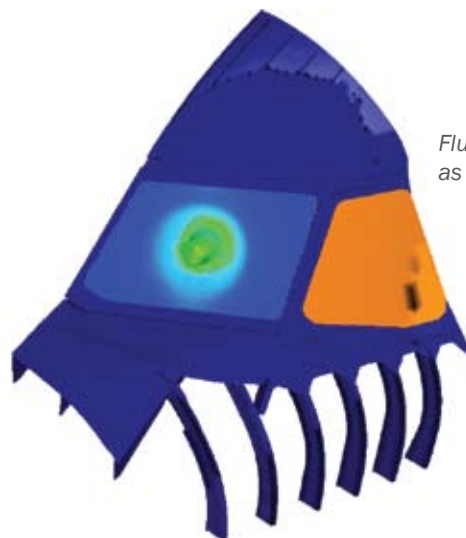
nonlinear, structural optimization, fluid-structure interaction, and multi-body dynamics applications ranging from basic to the most complex analyses. RADIOSS serves HyperWorks as its finite element solver hub, providing a comprehensive FEA solver for linear, nonlinear, multi-body dynamics, and fluid-structure interaction problems.

Quick Optimization Studies

RADIOSS is said to be suitable for a complex range of physics problems including noise vibration and harshness, crash analysis, drop testing, terminal ballistics, and explosions. It provides what the company describes as “superior” model checking, error messaging, and results accuracy. RADIOSS deploys up-to-date finite element formulations that enhance overall results accuracy.

Multiphysics capabilities within RADIOSS include fluid-structure interaction, aero-acoustics analysis, and external aerodynamics. A comprehensive material library listing correlated material laws and rupture models with definitions for concrete, foam, rubber, steel, composites, biomaterials, and more is standard.

When coupled with the company’s HyperCrash, RADIOSS provides a highly tuned and automated crash simulation environment. Since it is tightly integrated with Altair’s HyperStudyDSS, optimization and design robustness studies can be performed quickly.

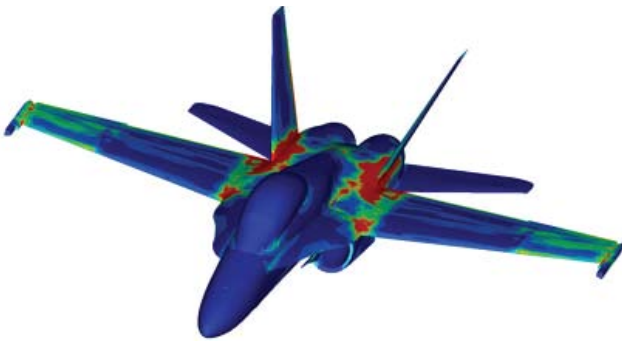


Fluid-structure interaction as seen in a bird strike

Linear Analysis Capabilities

Altair describes RADIOSS for Linear as the modern alternative to NASTRAN. To facilitate legacy and client data import and conversion, RADIOSS directly supports NASTRAN input and output data file formats. It features six degrees-of-freedom per grid shell element formulations, which eliminates problems resulting from AUTOSPC and K6ROT factors.

RADIOSS for Linear offers solver technology for linear statics, inertial relief, eigenvalue calculation, buckling, direct and modal frequency response, direct and modal transient response, random response, and NVH solution sequences.

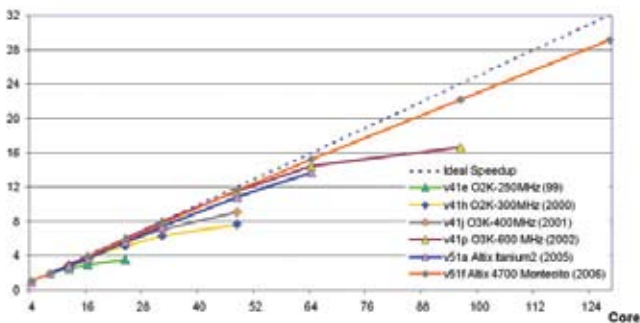


Linear dynamics demonstrated

RADIOSS also supports ply-based composite data input, and it can simulate structures with millions of degrees of freedom without any model size restrictions.

Under static loading, RADIOSS can predict structural deformation and stresses for models subject to point forces and moments, pressure, thermal, gravity, and centrifugal loads. In addition to fixed boundary conditions, inertia relief analysis can be performed for free-form structures.

Scalability Improvement of RADIOSS SPMD



Scalability improvement of RADIOSS SPMD

Analysis results output include element stresses, strains, strain energy, and forces; displacements and forces at grid points; applied loads, boundary condition reaction, and rigid element forces.

Linear-buckling analysis can be performed by RADIOSS to identify the buckling factors at which a structure becomes unstable due to an applied load.

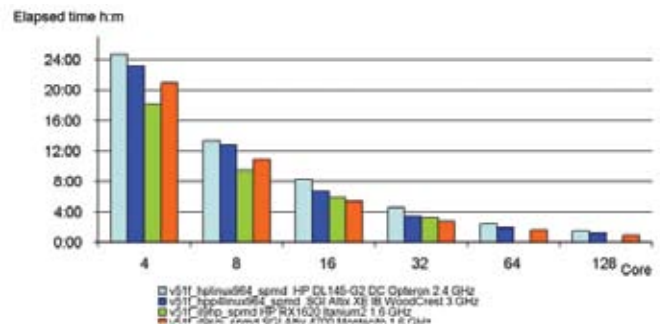
RADIOSS analyses can identify resonant frequencies and the mode shapes associated with those frequencies. In addition to natural frequencies and mode shapes, RADIOSS can output element modal stresses and strain energies Eigenvalue analysis can be performed using the built-in Lanczos solver or AMLS solver.

The linear steady state heat transfer analysis calculates the temperature field in a structure subjected to applied thermal loads. The thermal solution in RADIOSS allows for structures with both isotropic and anisotropic thermal material properties.

Other Linear Analysis Capabilities

For contact analysis, RADIOSS uses a quasi-static nonlinear solution. To solve the complex problem of modeling contact interactions between non-matching meshes, RADIOSS uses a grid to element gap element (CGAPG) that can be easily modeled in HyperMesh.

Advanced capabilities include handling initial penetration and using a coulomb friction model when there is a sliding contact.



Scalability improvement of RADIOSS SPMD

Also, complex material composites can be analyzed using RADIOSS to derive homogenized anisotropic shell properties from composite layup information and HyperMesh's laminate modeler helps to quickly define composite stacks.

Coupled fluid-structure frequency response in RADIOSS can be used to determine passenger compartment sound levels due to road and powertrain noise (NVH). This analysis simulates the transfer of energy (as sound pressure) from the vehicle structure to the air inside the cabin. The coupling matrix between the wetted structural surface and the surface of the fluid mesh is determined automatically.

Available as an internal capability of RADIOSS is stress-life or High Cycle S-N curve-type fatigue analysis. This methodology is relevant when the applied stress is primarily in the elastic range of the material and the resulting fatigue life (cycles to failure) is long.

Plus, response characteristics of a system subjected to sinusoidal inputs at varying frequencies can be calculated in RADIOSS, as well as transient analysis, which calculates the system response to a prescribed time-varying input. And last, superelement modeling is used to decompose large structures into substructures.

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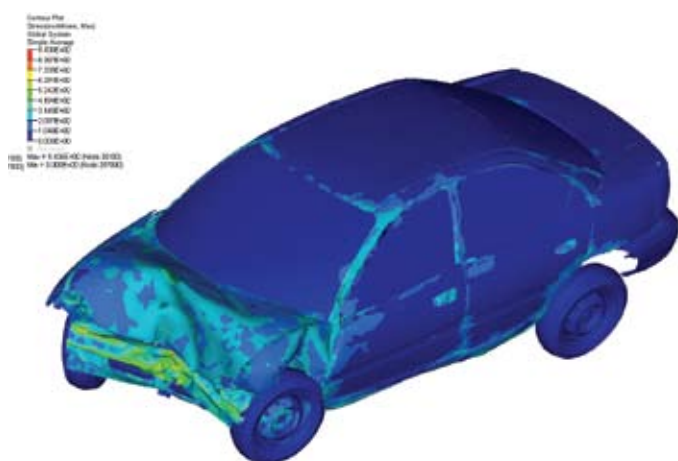
**Dr. Harold Thomas, Director of Solver Technology
Altair Engineering, Inc.**

Nonlinear Analysis Capabilities

RADIOSS for Non-Linear offers simulation capabilities that represent a mature and proven suite of analysis algorithms, says Altair. The company also notes that many of the capabilities in RADIOSS for Non-Linear were developed in collaboration with industry specialists, which has resulted in accurate solutions for realistic applications such as advanced material and rupture models.

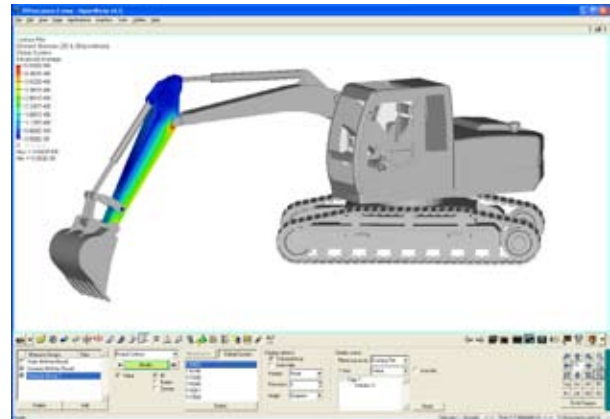
The multiphysics solution in RADIOSS enables engineers to study the design and robustness of products by simulating models using realistic boundary conditions. Additionally, you can mix libraries and models and user-defined subroutines to develop custom material laws and rupture models enables engineers to introduce the rupture model into the material law to accurately simulate any phenomena.

Crash and safety performance can be modeled for airbags, modeling the gas flow inside using the finite volume (ALE) method. RADIOSS handles the buckling and continuously maintains the contacts during complex scenarios.



Crash worthiness of an automobile

Nonlinear solution capabilities include multiphysics, metal forming and metal stamping, contact interfaces, ALE, SPH, multiple domain modeling, submodeling, CFD-noise analysis, composites, material law library, rupture model library, failure models, safety library, dummies, barriers, and impactors. This includes a partnership First Technology Safety Systems (FTSS).



Contour plot showing element stresses in 2D & 3D

Altair Engineering, Inc.’s Director of Solver Technology, Dr. Harold Thomas, explains “There is no other solver offering on the market today that provides the combination of solution scope, scalability and accuracy of RADIOSS. RADIOSS continues to win benchmarks against NASTRAN and has established a commanding presence in the crash analysis market. Under Altair’s unique HyperWorks business model, clients have realized that shifting or consolidating from a multiple-solver environment to RADIOSS generates immediate cost-savings while providing access to over 30 additional CAE software titles at no incremental cost.”

Company Support

Altair backs RADIOSS and its entire HyperWorks portfolio with a comprehensive support program ranging from newsletters to online tips and tricks to message boards in addition to traditional phone and e-mail service.

The company offers free 40-minute webinars in a HyperWorks Industry Vertical Webinar Series to improve the efficiency of your CAE programs, optimize the early stage of your designs, and reduce time and costs (see link below.)

Additionally, the company offers the HyperWorks Enabled Community (HWEC), a user- and partner application community where Partners’ applications and technical support become part of the HyperWorks platform and are available to users on-demand under one simple licensing model.

For more information about RADIOSS and the suite of HyperWorks products, visit www.altairhyperworks.com.



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