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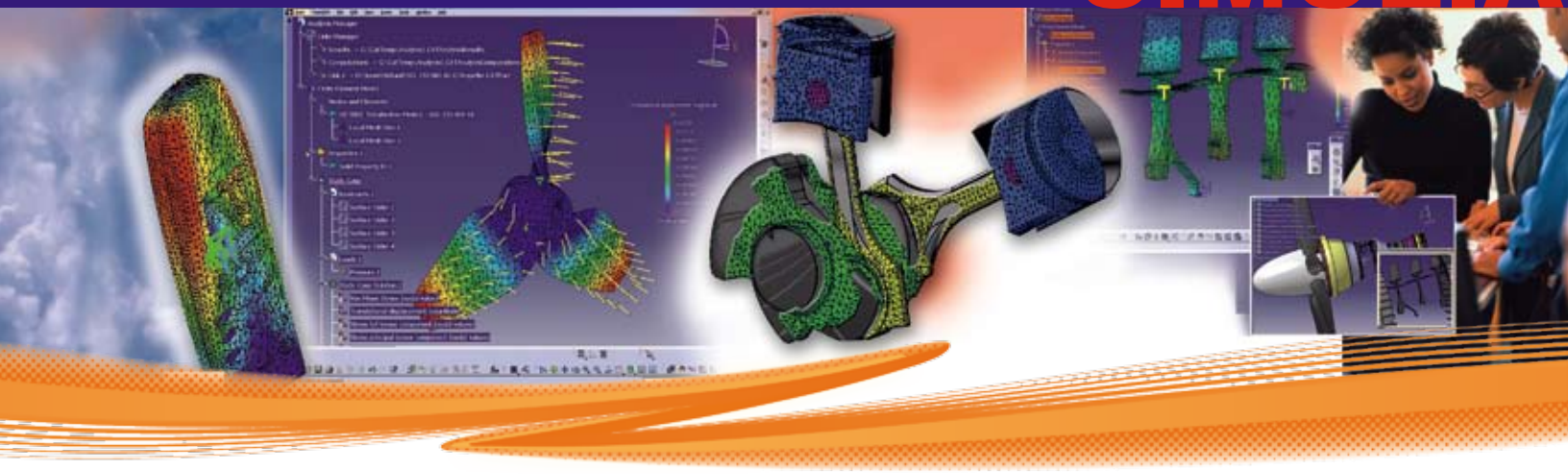
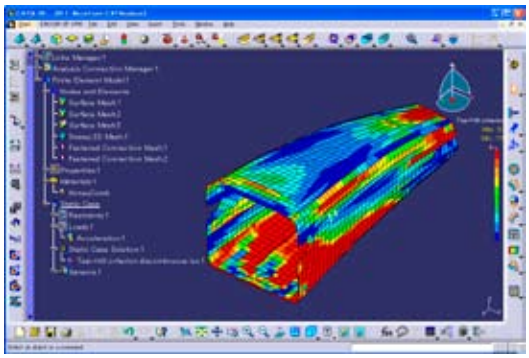


CATIA – Elfini Structural Analysis (EST)

Extends the preprocessing, solving, and postprocessing capabilities provided by Generative Part Structural Analysis (GPS)

Overview

Elfini Structural Analysis (EST) extends the capabilities of the GPS product to include multiple analysis cases for static, frequency, and buckling analysis. This product is more tailored to the needs of specialists, while maintaining a consistent user interface between specialists and design engineers. This common user interface promotes the teamwork between various disciplines to shorten the design analysis turnaround time.



Contours of Tsai-Hill failure criterion in a composite component

Product Highlights

- Enables the creation and simultaneous solution of multiple load cases for static, static constraint modes, frequency, and buckling analysis.
- Provides advanced variable bearing loads, thermal loads, and the import of generalized variable loads from external applications.
- Enhances the visualization of all analysis specifications with the display of loads, restraints, and mass on the mesh or geometry, including the visualization of analysis results with image customization and the simultaneous display of multiple images.
- Includes state-of-the-art high performance solution technology, including parallel processing and Lanczos solution, for the faster solution of large models.
- Allows vibration analysis of pre-stressed parts.
- Allows reports to be customized.

GPS is the backbone of the CATIA V5 Analysis solution. The other five CATIA Analysis products are combined with GPS to extend its integrated analysis capabilities.

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Features and Benefits

In addition to the functionalities and benefits provided by Generative Part Structural Analysis (GPS), Elfini Structural Analysis (EST) offers:

Advanced properties
EST provides more advanced ways to define the properties of the analysis model. It allows orthotropic materials to be defined where the material properties vary in different directions. It also allows membranes and shear panels to be modeled, and provides support for bar elements and more complex definition of beam elements.

Composites analysis
EST can use the specification of the layup of a composite part defined using Composites Design (CPD) or with an xml file, and calculate the appropriate composite material definitions. EST also allows plots of various composite failure measures to be created allowing designers to predict if composite designs will fail.

Advanced loading
EST provides a number of more advanced loading options than are available in GPS, enabling more accurate ways to represent the operating conditions being assessed. These include:

- Bearing loads: These can be used to represent the loading transmitted through a bearing without having to model the bearing in detail. The profile of the load, its direction, and angle of application can all be specified or defined using Knowledgeware.
- Thermo-mechanical loading: The temperature distribution of the parts can be specified, allowing the thermal stresses caused by those temperatures to be calculated.
- External loads: Loading data derived from applications external to CATIA V5 can be used. The loads and their spatial position are specified in Excel spread sheets or text files and these data are then mapped onto CATIA geometry and associated finite element mesh. This capability allows the behavior of the part or assembly to be studied based on loading from experimental calculations, test data, or simulations performed by other simulation programs.

Inertia relief
If the loading is out of balance, EST calculates and applies a uniform acceleration allowing a static solution for models that are not fully constrained.

Inertia definition
Lumped inertia at a point can be defined allowing a more accurate definition of the mass and inertia distribution when performing dynamic analysis.

Preprocessing visualization
EST provides additional tools to visualize and check the analysis specifications including loads, restraints, and added mass. The resulting images can also be customized using symbols, text, etc.

Multiple load cases
In many industries, such as aerospace, it is common to solve many hundreds or thousands of load cases. EST allows multiple linear load cases to be easily defined on a part or assembly and solved simultaneously and efficiently. EST also allows load cases to be combined, allowing the response to additional loading scenarios to be studied quickly and efficiently.

Buckling analysis
EST can estimate the load at which a component will buckle, using eigenvalue buckling techniques.

Advanced vibration analysis
While GPS allows the natural frequencies and mode shapes to be calculated, EST offers more advanced capabilities. The Lanczos solver is more efficient, particularly when large numbers of modes are required on large models. The modes and frequencies can be calculated for a preloaded structure, so that the load stiffening effects are accounted for. Frequency shifting also allows more accurate results for the modes in the frequency range of interest.

Controlled accuracy
GPS allows the user to specify a global target error which controls the adaptive meshing process. EST also allows the target error to also be specified locally on points, lines or surfaces, allowing more accurate results to be obtained in areas of interest, with a somewhat higher margin of error elsewhere.

Analysis of large models
On multi-core computers EST can reduce the solution time for large models by running in parallel on multiple cores.

Result evaluation
GPS allows the displacements and stresses in the structure to be reviewed. EST extends that to include the strains, contact pressure, and the forces in constraints and at restraints. When multiple load cases have been analyzed, envelope plots are available to determine the worst case from a series of load cases. Results plots and reports can be customized to match a user's particular needs. Local and more advanced sensors are available, i.e. to visualize the force flowing through a portion of the structure.

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