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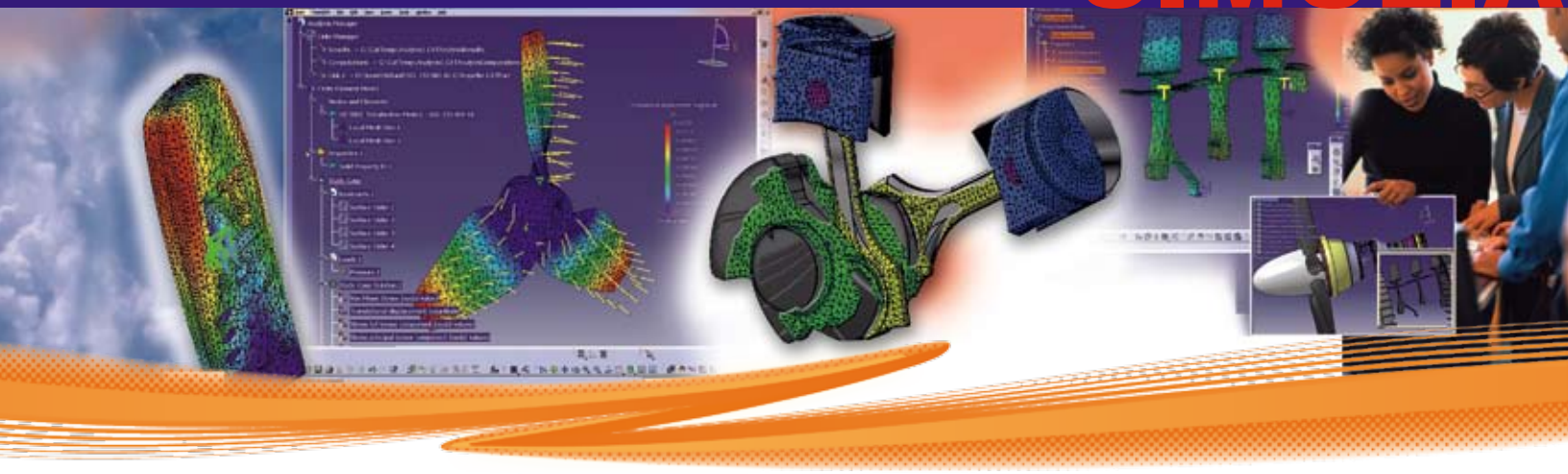


CATIA – Generative Part Structural Analysis (GPS)

Allows structural and modal analysis to be performed on parts at any stage of the design process

Overview

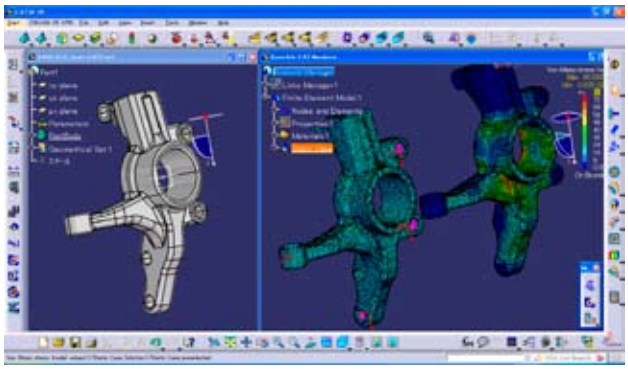
Generative Part Structural Analysis (GPS) allows designers to understand how their designs behave and to accurately calculate the displacements and stresses within the part under a variety of loading conditions. It also allows the vibration characteristics of parts to be assessed by calculating the natural frequencies and the associated mode shapes. Analyses can be performed on volume parts, surface parts and wireframe geometries.

GPS is ideal for designers who are not experts in finite element analysis. The finite element mesh automatically adjusts to ensure accurate results without manual intervention. The analysis specification is an extension of the design specification and the analysis is performed directly on the design geometry. The user interface is a natural extension of that in the CATIA design workbenches. This makes it intuitive and natural for designers to use GPS to ensure that their parts meet their design requirements.

Product Highlights

- Backbone of the CATIA V5 Analysis solution.
- Allows designers to more accurately size parts and understand the mechanical behavior of their designs.
- Provides rapid and accurate assessment of stress, displacement, and vibration characteristics.
- Analysis is performed within the CAD environment so the analysis model is fully associative with the CAD geometry and specification.
- Tightly integrated with knowledge-based engineering.
- Seamless analysis data management within PLM.

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.



Structural analysis of a steering knuckle including virtual rigid parts

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Features and Benefits

The backbone of the CATIA V5 Analysis solutions

GPS is the core of the V5 analysis portfolio. Other products can be combined with GPS to provide additional design analysis capabilities and to provide more advanced analysis and finite element modeling capability appropriate for analysis specialists. The complete CATIA V5 Analysis portfolio consists of Generative Part Structural Analysis (GPS), Generative Assembly Structural Analysis (GAS), Generative Dynamic Response Analysis (GDY), Elfini Structural Analysis (EST), FEM Surface (FMS) and FEM Solid (FMD).

No boundary between design and analysis

GPS is an easy-to-use tool tailored to designers and design engineers. The native integration within CATIA allows users to perform stress, displacement and vibration analysis at any time in the design process, allowing more accurate sizing of parts and fewer design iterations. Individual parts consisting of solid, surface and wireframe geometries can be analyzed under a variety of loading conditions. The analysis specifications, such as loads and restraints, are associative with the design allowing users to perform analyses quickly and easily.

Straightforward analysis definition

The analysis specifications, including loads, restraints, and material characteristics are applied directly to the design features. These specifications are then automatically incorporated into the underlying finite element model, meaning that users do not have to work directly with the finite element model. “Virtual parts” allow items like forces, moments and restraints to be easily modeled without having to have a detailed geometric representation.

Extended vibration analysis

GPS can calculate the natural frequencies and associated mode shapes of parts, allowing designers to understand the vibration characteristics of their designs including potential areas of resonance. The non-structural mass distribution associated with the part can be defined using linear density, surface mass density, and point masses. The user can choose the number of modes and frequencies to be calculated and can animate the deformations of the mode shapes.

Report generation

Standard reports can be automatically generated in HTML format, providing clear and detailed information about the results of the analysis, including images associated with the computations. These reports can be used to document the analyses that have been performed and to communicate the results of the analysis to other stakeholders in the organization.

Interactive interpretation of results

GPS provides a number of ways for a designer to understand the behavior of their design. The deformed shape can be plotted and the displacements scaled to ensure that they are visible. The displacements, stresses and local solution error can be visualized using contour plots, which can be displayed on either the undeformed or the deformed shape of the part. A cutting plane can be dynamically moved though a part, with contours shown on the cut plane, allowing the behavior of complex parts to be studied interactively. Any of the principal stresses or the von Mises stress can be plotted – the latter is particularly useful to determine if the loading would cause yielding of the material and permanent deformation of the part.

Controlled accuracy

Normally, GPS automatically creates a finite element mesh and adapts the mesh to ensure that the results are accurate with little or no user input. However, more experienced users can control the meshing algorithm, allowing the trade-off between computational time and the quality of the results to be optimized. Users can also switch between linear and quadratic elements and create, modify, and remove elements directly.

High performance

GPS uses a state-of-the-art sparse solver that computes the results rapidly while minimizing the amount of memory consumed. It takes full advantage of the additional memory available in 64 bit computers and will run in parallel on multi-core computers allowing the solution of very large models.

Knowledge-based technology

The knowledge associated with design analyses can be captured and used to perform optimization. The generative analysis specifications are recognized as knowledge parameters called “sensors”, providing measures that can be re-used. Rules, checks and formulae can be used to define best practices and ensure that analyses performed are compliant with corporate standards.

Seamless analysis data management within PLM

CATIA V5 Analysis users benefit naturally from the overall PLM solution provided by Dassault Systèmes including ENOVIA V5 for data and product lifecycle management. CATIA V5 Analysis users can store, manage, and version all the data associated with their product’s simulation and share the information within the extended enterprise. This unique capability allows collaboration and provides access to advanced PLM practices such as concurrent engineering and change management.

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