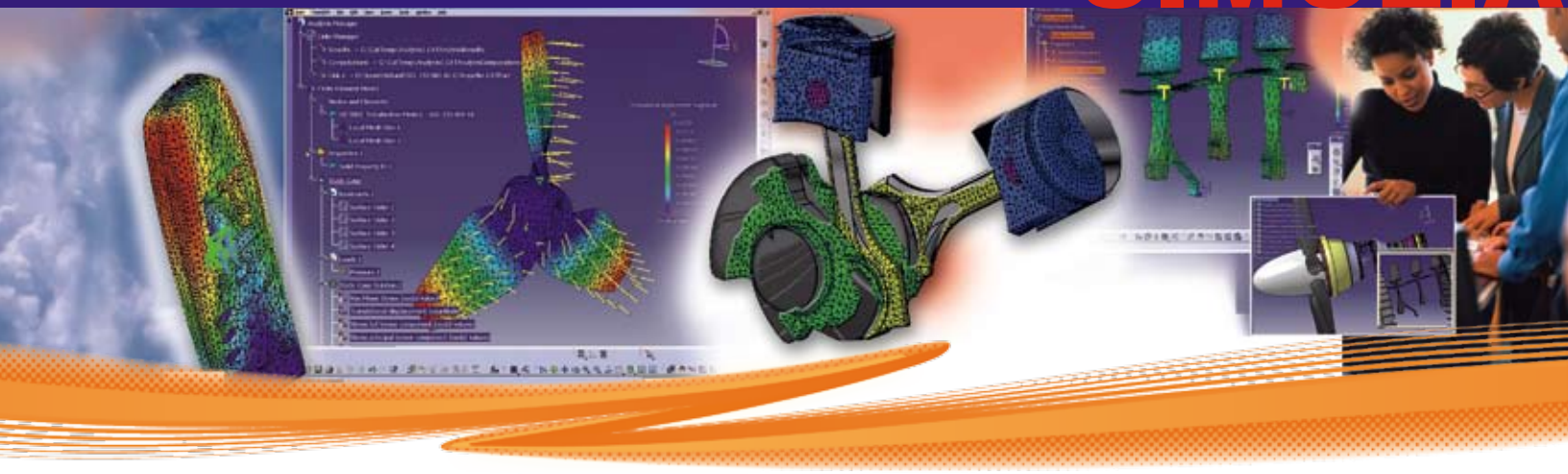


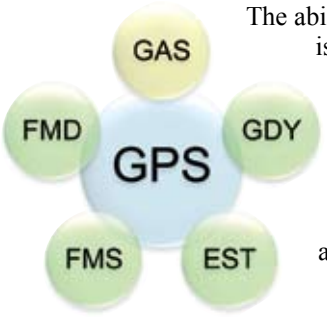
Generative Assembly Structural Analysis (GAS)

Extends the capabilities of Generative Part Structural Analysis (GPS) to assemblies

Overview

Generative Assembly Structural Analysis (GAS) extends the capability of GPS, allowing designers to analyze assemblies as well as individual parts. The analysis of assemblies, including an accurate representation of the way the parts interact and are connected, allows for more realistic and accurate simulation. The designer does not have to make simplifying assumptions about the loading and restraints acting on an individual part. Instead the part can be analyzed within the environment that it operates with the loading automatically determined based on the way the part is connected to and interacts with surrounding parts.

GAS supports hybrid assemblies that include solids, surface, and wireframe geometry, as well as "assemblies of analysis", namely assemblies made up of parts that include analysis specifications. A comprehensive set of tools is available to model the interaction of the different parts in an assembly including frictional contact, welding, and user-defined connections. In addition, the seamless integration of design and analysis allows connection properties from any V5 application, such as Assembly Design (ASD), to be used.

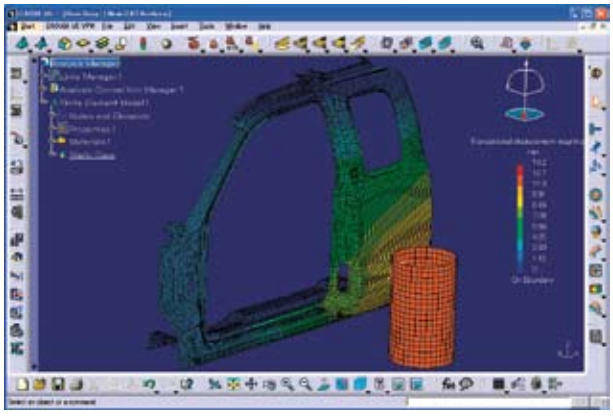


The ability to perform assembly of analysis is one of the concurrent engineering practices enabled by PLM. The time to analyze complex assemblies is reduced by allowing several designers to work on analyzing individual parts which can then be combined into an overall analysis assembly.

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.

Product Highlights

- Achieves fast and accurate structural and modal analysis of an assembly.
- Uses the assembly constraints and parts' material specifications from the design.
- Provides a wide range of connections and interactions.
- Simulates the effect of bolt tightening and pressure fitting.
- Supports assembly of analysis for efficient concurrent engineering.



Assembly analysis of a car door using compatible spot welded connections and contact analysis

SIMULIA

Features and Benefits

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

Stress and vibration analysis on complex assemblies

GAS extends the integrated analysis capabilities in GPS to the displacement, stress, and vibration analysis of assemblies, which can include solid, surface, and wireframe geometry.

Wide range of connections and interactions

- From CATIA V5 applications: Users can directly re-use all the assembly connections defined in Assembly Design (ASD), Automotive Body in White Fastening 3 (ABF), Structure Design 1 (SR1), and Equipment Support Structure (ESS) when performing analyses with GAS. The generative capability within all these products allows the analysis to be updated automatically when the design changes.
- From scratch: Users can define many types of connections on compatible (if used in conjunction with FMS) and incompatible meshes. The following types of face-to-face or distant connection are available:
  - Fastened: connected surfaces or edges are permanently joined (if desired a spring stiffness can be defined for the connection)
  - Contact: surfaces can slide and separate, but not penetrate (friction can be included)
  - Slider: connected surfaces can slide but not separate or penetrate
  - Rigid: points, edges, or surfaces can be rigidly connected to other points, edges, or surfaces
  - Smooth: points, edges, or surfaces can be connected to other points, edges, or surfaces and allow for some deformation of the connection
  - User defined: the properties of the connection can be specified by defining the translational and rotational stiffness

Smart mesh generation

Before running an analysis, GAS automatically generates a finite element mesh for each of the parts in the assembly. Mesh connections between the part meshes are also generated based on the various assembly connections and interactions that have been defined. This entire process is automatic; no time-consuming, complicated manipulation of the meshes is required. Adaptive meshing allows accurate results to be obtained with little or no user input.

Bolted connections

GAS allows designers to easily model and understand the behavior of bolted connections. The bolt can be included either as a full geometric model or as a virtual bolt when no geometry is available (or desired). A bolt tightening tool allows the initial tightening force in the bolts (geometric or virtual) to be specified and GAS calculates the associated pre-stress and contact state between the components. The response of the bolted assembly can then be determined under service loads and the forces in the bolts monitored.

Welded connections

For greater analysis detail, special welded connections are available including spot, seam, and adhesive welds. The welds can be rigid or flexible with user-defined properties.

Pressure fitting

It is common for components in an assembly to be pressure fitted to hold them in place. The parts are modeled in their undeformed state and GAS simulates the pressure fitting process by forcing the parts apart to remove the overclosure. If the overclosure is small, it can be specified directly for a more accurate simulation.

Results interpretation

Where contact between parts is being modeled, the contact pressure between the parts can be plotted; in pressurized systems, this can be used to determine if leakage will occur. By placing a sensor on a connection, the forces being transmitted through the connection can be output, allowing the strength of the connection to be checked and the way that the forces are distributed in the design to be assessed.

Concurrent engineering

The “assembly of analysis” capability in GAS enables concurrent engineering. For example, the various parts in an assembly can be modeled and meshed separately by different users. They can either use the CATIA V5 meshing tools or import orphan meshes (meshes that don’t have any geometry associated with them) developed outside of CATIA Analysis using a variety of different modeling tools. The user responsible for analyzing the assembly can consolidate the different meshes, connect the parts, apply the loading specifications, and run the simulation. This can significantly reduce the turnaround time when analyzing large assemblies, particularly since some of the parts may have already been analyzed and therefore, the analysis models would already be available.

SIMULIA World Headquarters
166 Valley Street
Providence, RI 02909 USA
+1 401 276 4400
E-mail: simulia.info@3ds.com

DASSAULT SYSTEMES

SIM-CAT-GAS-1008