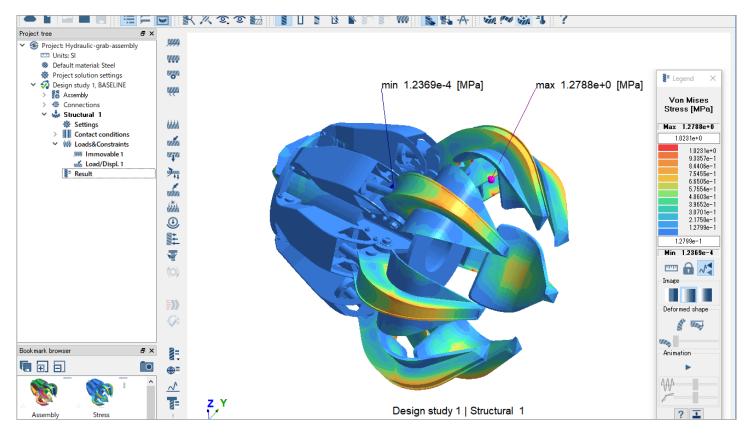# Altair SimSolid™
Structural Analysis for Rapid Design Iterations

△ Altair | HyperWorks

Altair SimSolid is a structural analysis software developed specifically for rapidly evolving design processes. It eliminates geometry simplification and meshing, the two most time-consuming and expertise-extensive tasks done in traditional FEA, enabling the analysis of fully-featured CAD assemblies in minutes without meshing.

Product Highlights

- Eliminate geometry simplification and meshing. With SimSolid, model preparation is done in minutes.
- Analyze complex parts and large assemblies. SimSolid is tolerant of imprecise geometry, and its assembly connections are industry best at handling ragged contact surfaces.
- Advanced automation workflows are built into SimSolid to help setup large models in a few minutes.
- Get results in seconds to minutes, SimSolid is fast, really fast. Hence, multiple design scenarios can be quickly analyzed and compared.

Learn more:
altair.com/simsolid

SimSolid can analyze complex parts and large assemblies not practical with traditional FEA and do it efficiently on a desktop class computer. Both fast and accurate, SimSolid controls solution accuracy using a unique multi-pass adaptive analysis.

The computational engine is based on breakthrough extensions to the theory of external approximations. External approximations are a generalization of Finite Element Method (FEM) in terms that:
- Absolutely arbitrary geometrical shapes can be used as "finite elements"
- Basis functions which approximate field of interest in the part volume can be of arbitrary class and are independent of the volume shape

SimSolid does not use the point-wise degrees of freedom (DOF) inherent in traditional FEA.

SimSolid's DOF are functionals with geometrical support in the form of volumes, areas, line clouds, and point clouds. This provides the ability to handle geometrical

imperfections, as well as assembly contact imperfections like gaps, penetrations and ragged contact areas.
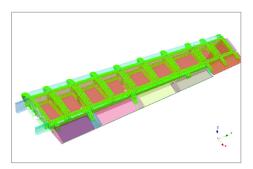
SimSolid controls solution accuracy using multi-pass adaptive analysis. Adaptivity can be defined on a global or part local basis and adaptivity is always active. The methodology is fast and efficient. It provides superior performance metrics for computational time and memory footprint that allow very large and/or complex assemblies to be solved quickly on desktop class PC's.
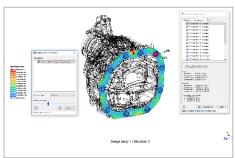
Benefits
Eliminate Geometry Simplification and Meshing
SimSolid's unique technology completely eliminates geometry simplification and meshing, the two most time consuming, expertise extensive and error prone tasks done in traditional FEA. With SimSolid, model preparation is done in minutes.
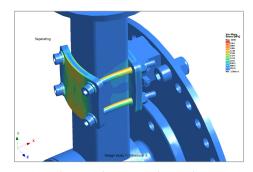
Create 1000's of connections in seconds

Reaction and connection forces to understand the structural behavior

Nonlinear analysis accurately reproducing the contact between bolt and plate

Analyze Complex Parts and Large Assemblies

SimSolid has been designed to analyze complex parts and large assemblies not practical with traditional FEA. SimSolid is tolerant of imprecise geometry. Its assembly connections are industry best at handling ragged contact surfaces with both gaps and overlapping geometry.

Advanced Automation Workflows

SimSolid has intelligent workflows that let you create complex connections—spot welds, seam welds, bolted joints, adhesives and more—in minutes. These workflows reduce or entirely eliminate the model setup time when working with multiple design variants. When importing a new design variant, SimSolid automatically maps materials, connections, loads and boundary conditions. The software also allows the mapping of loads from an external file.

Rapid Design Feedback

SimSolid is fast, real fast. Solution times are typically measured in seconds to minutes on a standard PC. With SimSolid, multiple design scenarios can be quickly analyzed and compared. And, accuracy can be specified on an individual part level allowing a rapid drill down to any level of detail that is required.

Capabilities

Analysis Solutions

The following simulation types are supported: linear statics, modal, nonlinear statics (contact, material & geometrical), thermal, coupled thermal-stress, linear dynamics (time, frequency and random response).

Supported Connections and Boundary Conditions

- Assembly Connections: Smart auto connections, bonded, sliding, separating with friction, bolted, spot & laser welds, fillet/seam welds, bushings, adhesives and virtual connectors
- Loads & BC's: Immovable constraint, sliding constraint, hinge constraint, enforced displacement, force, pressure, gravity, thermal, inertia relief, bolt/nut preload, dynamic loads, hydrostatic loads, bearing loads, and remote loads

Material Properties

- Isotropic
- Incompressible
- Elastoplastic with NL stress vs strain curves
- Rigid
- User extensible

CAD Connectivity

- Direct data integration to Cloud-based CAD systems
- Standard STL output from any CAD system
- Direct file support for mainstream CAD systems: CATIA, NX, Creo, SOLIDWORKS and Inventor
- Direct file support for common neutral formats: STEP, ACIS and Parasolid, etc.

Post-Processing and Reporting
Result types

- Contour plots with displacements, stresses, strains and energy densities
- Deformed shape animation
- Max/min labels
- Point probes and datum point sets
- XY plots
- Reaction/contact forces
- Nonlinear contact response including contact pressure and openings
- Bolt/nut forces
- Spot weld forces
- Frequencies and mode shapes
- Modal participation factors, effective and cumulative mass
- Partial dynamic response
- Safety factors

Reporting

- Image thumbnails and captions associated with model graphics state, part visibility, and results display
- Synchronized model and results browsing
- Results are exported as full resolution image files

General Usability

- Able to process mixed (SI and IPS) units
- Measurements (distance, ray probe, local coordinates)
- Global and local coordinate systems
- Default views (front, back, left, right, top, bottom)
- Custom saved views

"SimSolid is extremely impressive. It allows our team to go beyond the limitations of CAD embedded simulation. We now accurately evaluate our structures in minutes, gain confidence early and save loads of time!"

Richard Reeson, Senior Engineer
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