

Abaqus/CAE 6.9

Geometry

Geometry Creation Tools

- Solid features
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Draft, twist, and pitch
 - Fillet/chamfer
- Cut features
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Circular hole
- Shell features
 - Planar surface
 - Extrude
 - Loft
 - Revolve
 - Sweep
 - Fillet/chamfer
- Wire features
 - Planar
 - Poly line
 - Spline
 - Fillet
- Datum geometry
- Partitioning tools
 - Edge
 - Face
 - Cell

2-D Sketcher

- Point
- Line
- Circle
- Rectangle
- Arc
- Fillet
- Spline
- Ellipse

Sketch Tools and Options

- Constraints
- Parameters
- Translate/rotate/mirror/scale
- Trim/extend/break/merge
- Project edges
- Offset entities
- Linear/radial pattern
- Dimensioning
- Construction geometry
- Sketch origin placement
- Sketch cleanup
- Sketch import/export

Geometry Import/Export

- CAD Associative Interfaces (add-on modules)
 - CATIA V5
 - SolidWorks
 - Pro/ENGINEER
 - CAD feature parameter update
- CAD geometry translators (add-on modules)
 - CATIA V4
 - I-deas NX
 - Parasolid
- Assembly import
- Neutral format import
 - SAT, IGES, STEP, or VDA
- Import of parts from Abaqus input (.inp) files or output database (.odb) files
- Geometry export
 - SAT, IGES, STEP, or VDA

Model Import/Export

- Model database (.cae) files
- Models from Abaqus input (.inp) files
- Nastran bulk data files

Geometry Repair Tools

- Automated repair during import
- Repair small edges
- Merge edges
- Repair invalid edges
- Remove redundant entities
- Repair small faces
- Replace faces
- Repair sliver
- Remove faces
- Create face
- Solid from shell
- Stitch edges
- Repair face normals
- Convert to analytical
- Convert to precise

Assembly

Instance Tools

- Create/suppress/resume/delete
- Linear/radial pattern
- Translate/rotate
- Replace
- Query

Merge/Cut Tools

- Geometric parts
- Merge orphan mesh

Sets and Surfaces

- Geometric sets containing vertices, edges, faces, skins, or cells

- Orphan mesh sets containing nodes or elements
- Native mesh sets and surfaces
- Surface regions
- Merge sets/surfaces

Model Display

- Display groups
- Selection tools
- Pick filters
- Translucency control

Color Coding

- Display model geometry and mesh elements in configurable colors
- Color by attribute

Properties

Material Models

- General
- Elasticity
- Electrical properties
- Mass diffusion
- Plasticity
- Pore fluid properties
- Thermal properties
- Gasket
- Acoustic medium
- Damage initiation criteria and evolution
- Brittle cracking
- Equation of state (EOS) materials
- User materials
- Hyperelastic/viscoelastic material evaluation

Materials Management

- User libraries

Sections

- Solid
 - Homogeneous
 - Composite
 - Eulerian
 - Generalized plane strain
- Shell
 - Homogeneous
 - Composite
 - Membrane
 - Surface (rebar layers)
 - Shell offset
- Beam
 - Beam
 - Truss
 - Other
 - Gasket
 - Cohesive
- Gasket
- Beam section profiles
 - Profile library
 - Arbitrary
 - Generalized



Composites

- Ply layup definition and management
- Layer orientation and thickness distributions
- Ply stack plots
- Classic laminate theory
- Nonlinear progressive damage and failure
- Ply-based output request

Orientations

- Beam section
- Material
- Rebar
- Shell normal

Special Engineering Features

- Fasteners
 - Point-based
 - Discrete
 - Points import, definition, and patterning tools
- Skins and stringers
- Inertia
 - Point mass/inertia
 - Nonstructural mass
 - Heat capacitance
- Springs/dashpots

Analysis Support**General, Linear, and Nonlinear Analyses**

- Static stress/displacement analysis
- Viscoelastic/viscoplastic response
- Dynamic stress/displacement analysis
- Heat transfer analysis (transient and steady-state)
- Mass diffusion analysis (transient and steady-state)
- Acoustic analysis
- Coupled problems
 - Thermo-mechanical
 - Thermo-electrical
 - Piezoelectric
 - Pore fluid flow-mechanical
 - Thermo-mechanical mass diffusion
 - Shock and acoustic-structural
- Abaqus/Standard to Abaqus/Explicit cosimulation

Linear Perturbation Analyses

- Static stress/displacement analysis
 - Linear static stress/displacement analysis
 - Eigenvalue buckling estimates
- Dynamic stress/displacement analysis
 - Natural frequency extraction
 - Complex eigenvalue extraction
 - Transient response via modal superposition
 - Steady-state response to harmonic loading
 - Response spectrum analysis
 - Random response analysis

Analysis Controls

- General solution controls
- Solver controls
- Adaptive mesh domain
- Adaptive mesh controls

Output Requests

- Field output
- History output
- Integrated output sections
- Contact status output
- Restart, diagnostic, and monitor output
- Sensors

Constraints and Interactions**Contact**

- Automatic contact detection and setup
- General contact (Abaqus/Standard and Abaqus/Explicit)
- Surface-to-surface contact
- Self-contact

Contact Properties

- Mechanical
 - Normal
 - Tangent
 - Damping
 - Clearance-dependent
 - Surface-based cohesive contact and damage
- Thermal
 - Conductance
 - Heat generation
 - Boundary radiation
- Film coefficient

Interactions

- Cyclic symmetry
- Cavity/surface radiation
- Surface/concentrated film condition
- Elastic foundations
- Acoustic impedance
- Actuator/sensor

Constraints

- Tied surfaces
- Equations
- Display body
- Rigid and isothermal bodies
- Coupling
- Multi-point constraints
- Shell-to-solid coupling
- Embedded regions

Connectors

- Basic
 - Translational
 - Rotational
- Assembled/complex
- Connector builder to easily define connectors

Boundary Conditions

- Nodal
- Velocity
- Acceleration
- Velocity/angular velocity
- Submodel
- Pore pressure
- Electric potential
- Temperatures
- Predefined fields
- Initial state (from previous analysis)
- Spatially varying boundary conditions

Loads

- Mechanical
- Bolt load
- Thermal
- Acoustic
- Fluid
- Electrical
- Mass diffusion
- Fields
- Multiple load cases
- Spatially varying loads

Analytical and Discrete Fields

- Analytical fields for prescribed conditions
- Discrete fields for prescribed conditions, orientations, offset, and shell thicknesses
 - Volume fraction discrete field

Amplitude Curves

- Tabular
- Equally-spaced
- Periodic
- Modulated
- Decay
- Solution-dependent
- Smooth-step
- Actuator
- User

Fracture Mechanics

- Contour integral
- Extended finite element method (XFEM)

Meshing**Mesh Seeding**

- Global seed size
 - Curvature-based refinement
 - Minimum element size
- Edge seed
 - Uniform
 - Biased
 - By size
 - By number

Structured Meshing

- 1-D
- 2-D regions
- 3-D solid regions



Surface Meshing

- Automatic quadrilateral meshing
 - Medial axis
 - Advancing front
- Automatic triangular meshing

Solid Meshing

- Fully automatic tetrahedral meshing
- Fully automatic swept meshing
 - Medial axis
- Bottom-up hexahedral meshing

Virtual Topology

- Combine faces/edges
- Automatic creation/restore tools

Element Quality

- Statistical and analysis checks
- Stable time increment
- Maximum allowable frequency
- Mesh deviation computation

Queries

- Mass and mesh
- Stable time increment
- Maximum allowable frequency

Mesh Edit

- Node
 - Create
 - Edit
 - Delete
 - Merge
 - Adjust midside
 - Project
- Element
 - Create
 - Delete
 - Flip surface normal
 - Orient stack direction
 - Collapse/split edge
 - Swap diagonal
 - Split/combine elements
- Offset (create shell/solid layers)
- Automatic collapse of sliver edges
- Convert triangular elements to tetrahedral elements
- Refine 2-D planar meshes

Adaptive Remeshing

- Automatic and manual

Element Library

- Beam
- Truss
- Connector
- Shell
- Membrane
- Cohesive
- Continuum shell
- Continuum
- Elbow
- Gasket
- Pipe
- Eulerian

Job Management

- Submission
- Parallel computing options
- Restart
- Monitor and view job files
- Abaqus/Standard and Abaqus/Explicit co-execution

Visualization

- Model plotting
- Deformed, contour, vector/tensor, path, extreme value, ply-stack, through thickness, tick mark, overlay, material orientation, and X-Y plots
- Loads display
- View manipulation, linked viewports, and camera options
- Multiple viewports and view synchronization
- Automatic color coding
- View cuts
 - Planar/cylindrical/spherical
 - Isosurface
 - Resultant force/moment output
- Free-body cuts
- Animations
 - Movie import/export and overlay
- Mirroring and patterning of symmetric models
- Failed element removal
- Stress linearization
- X-Y data operators and data filtering
- Tabular data reports
- Probe/query tools
- Network connection to remote output databases
- Diagnostics visualization
- Automatic report generation

Process Automation

- Python scripting
- GUI toolkit
- Macro manager
- Plug-ins architecture
- Python Development Environment (PDE)

Plug-ins

- Examples
- Interactive plug-in GUI builder (RSG)
- Script upgrade
- Excel utilities
- NVH postprocessing
- Adaptivity plotter

Printing and Output

- PS/EPS/PNG/TIFF/SVG
- 3D XML/VRML
- Hardcopy

Documentation and Online Help

- User's Manual
- Getting Started Manual
- Release Notes

Supported Platforms

- Windows/x86-32
- Windows/x86-64
- Linux/x86-32
- Linux/x86-64

Product Support

- Maintenance and support
- Quality Monitoring Service
- Installation
- Training and users' meetings

Related Products**DDAM for Abaqus**

- Collection of response spectrum procedures
- DDAM-specific input forms
- Specialized DDAM output data

CAD Associative Interfaces and Geometry Translators

- CAD Associative interfaces for CATIA V5, SolidWorks, and Pro/ENGINEER
 - Enables synchronization of CAD and CAE assemblies and seamless updates
- Geometry translators for CATIA V4, I-deas NX, and Parasolid

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