Abaqus/CAE 6.9 Extended Functionality

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
- Ansys input file import

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

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SIMULIA

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
- Surface- and direction-based

Special Engineering Features
- Fasteners
  - Point-based
  - Discrete
  - Points import and definition
  - Projection, offset, 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)
- Direct cyclic
  - Low-cycle fatigue
- 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

Multi-Step Setup
- Step suppression

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 deactivation/reactivation

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
- Model change

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
- Eulerian (inflow/outflow/motion)

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)

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SIMULIA

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
- Mapped 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
- Unmeshed regions

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
- Cylindrical

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
- Beam profile and shell thickness display
- 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
- STL import

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

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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