Design Studio for Genesis

A Graphical User Interface
for the ***GENESIS***
Structural Analysis and Optimization Software

New Features and Enhancements

Versions 16.0

March 2017

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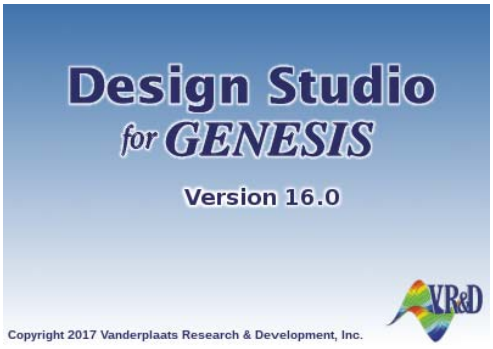
1 Introduction

This document describes the enhancements and new features added in Design Studio for Genesis 16.0.

Enhancement Summary

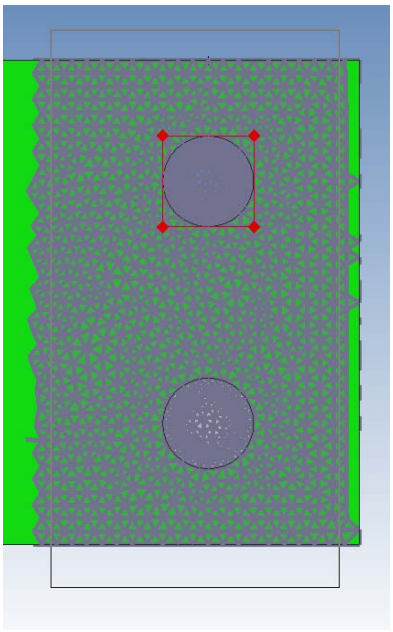
- *GENESIS* 16.0 Compatibility
- Enhanced Element/Group Selection Performance
- Enhanced Desktop Integration
- Enhanced Coarsened Surface Export
- Multiple Models
- New Standard Lattice Bar Toolkit Plugin
- 1-D Element Display Enhancement
- Modify Grid Enhancements
- Duplicate Domain Enhancement
- Bar Force/Stress Postprocessing
- Lua Scripting Enhancements



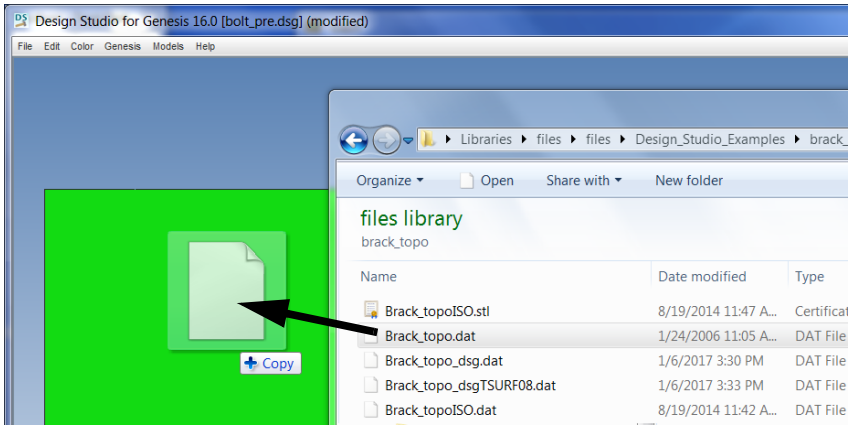
2 General Enhancements

1. *GENESIS* 16.0 Compatibility. Design Studio has been enhanced to handle all of the new capabilities of *GENESIS* 16.0. New features in *GENESIS* 16.0 include: New topology fabrication constraints and reliability criterea for constraints.

2. Enhanced Element/Group Selection Performance. New algorithms are used to select elements/groups within a dragged-out rectangle. For certain graphics hardware, the new methods are dramatically faster.

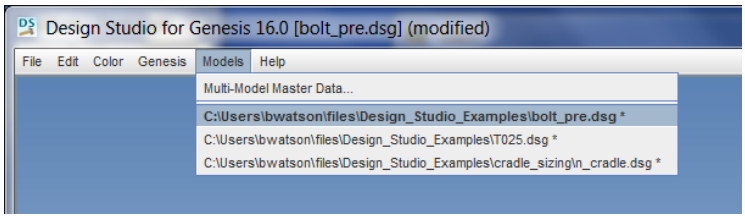


3. Enhanced Desktop Integration. Now files can be dragged and dropped from the desktop or File Explorer windows onto the Design StudioViewport. Dropped files will be opened/imported. Design Studio database files (*.dsg), *GENESIS* input files (*.dat, *.mdat), and post-processing files (*.pch, *.op2, *.HIS) are supported.



4. Enhanced Coarsened Surface Export. Now when the option to show 2-D or 1-D elements are solid is selected, the coarsed surface export will match the displayed solid image.

5. Multiple Models. Now Design Studio can open multiple models simultaneously. There is a new “Models” menu to switch among the opened models. In addition, there is a new “Close” option in the File menu to close the current model. When a file is imported, by default, a new model will be automatically created. An option on the file selection dialog allows the previous behavior of appending to the current model.

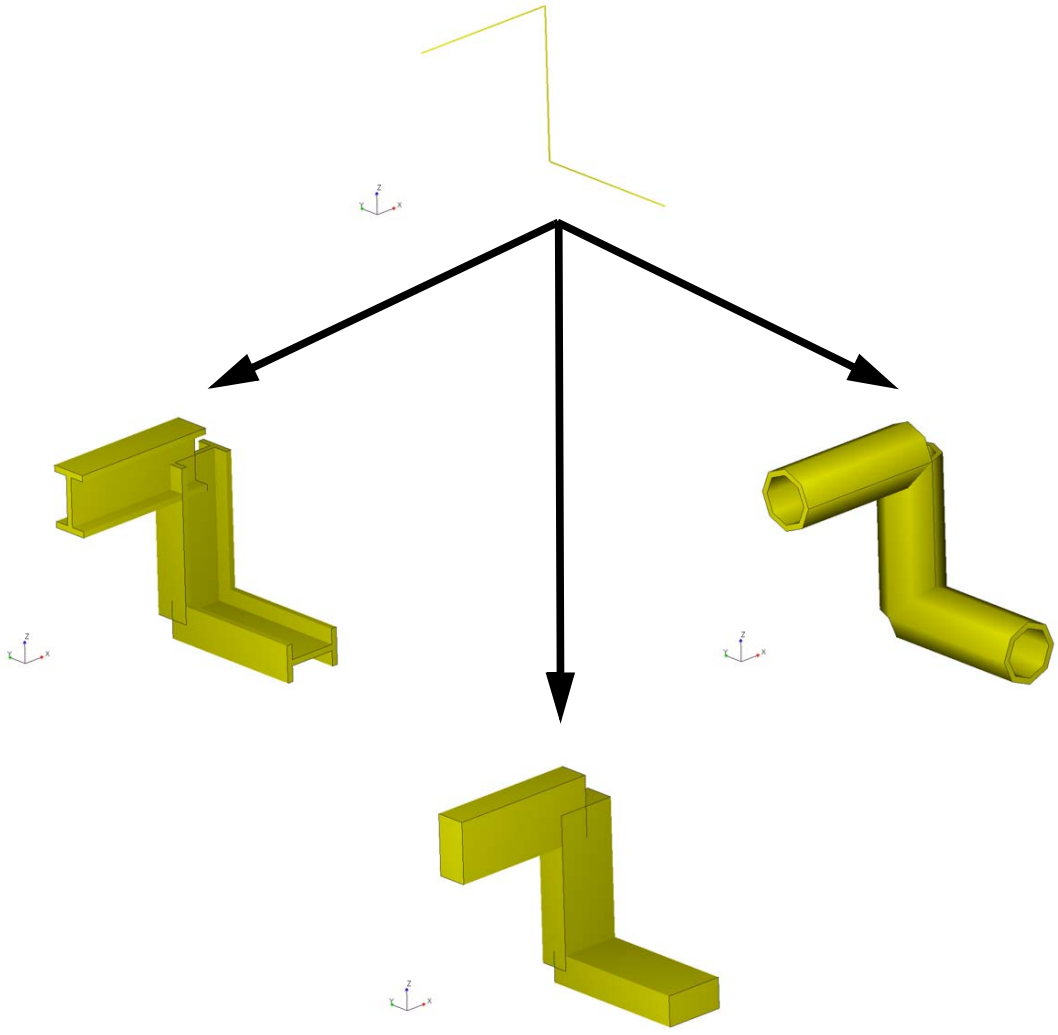


6. New Standard Lattice Bar Toolkit Plugin. A new plugin is included that makes it easy to create and design lattice patterns that are commonly used in additive manufacturing applications. The toolkit can automatically create bar lattices to replace solid elements, using topology density results. The toolkit can also setup a “grid-sizing” optimization of a bar lattice, whereby each grid is given independent design variables. This efficiently approximates tapered bars in the lattice.

7. New Examples. There are twelve new step-by-step example problems in the Design Studio Examples manual that illustrate new capabilities of *GENESIS*.

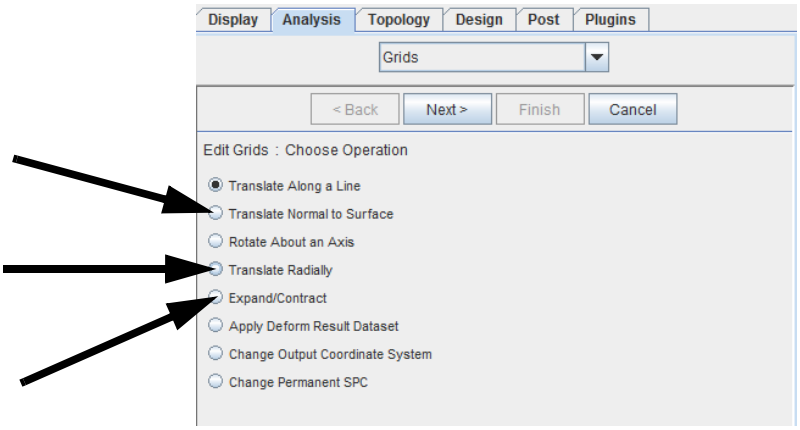
3 Display Enhancements

1. 1-D Element Display Enhancement. A new option allows 1-D elements to be drawn as solid, so that the cross section shape and dimensions are revealed.



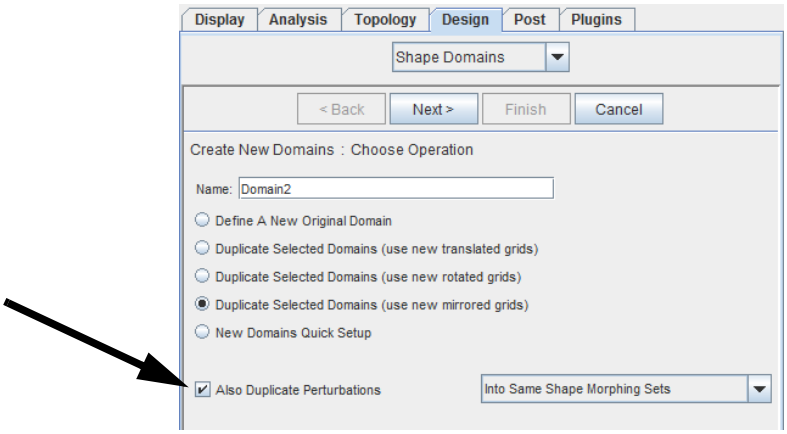
4 Analysis Preprocessing Enhancements

1. Modify Grid Enhancements. There are three new operations to relocate grid points. “Translate Normal to Surface” can move grids normal to shell or solid surfaces. “Translate Radially” can move grids inward or outward with respect to a chosen axis. “Expand/Contract” can scale the x, y and/or z coordinates of grids with respect to a chosen coordinate system.



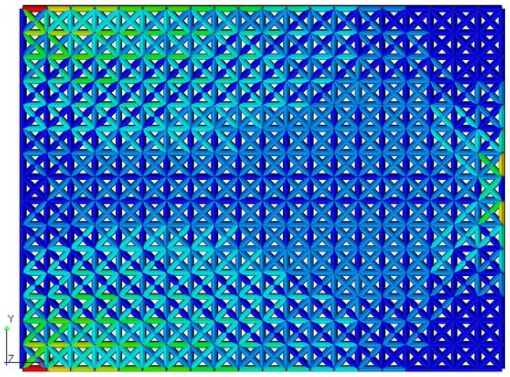
5 Design Preprocessing Enhancements

1. Duplicate Domain Enhancement. Now when domains are duplicated, there is an option to also automatically generate duplicated perturbations corresponding to existing perturbations on the original domain. The new perturbations can be added to the original shape morphing sets, or a new shape morphing set can be created for them.

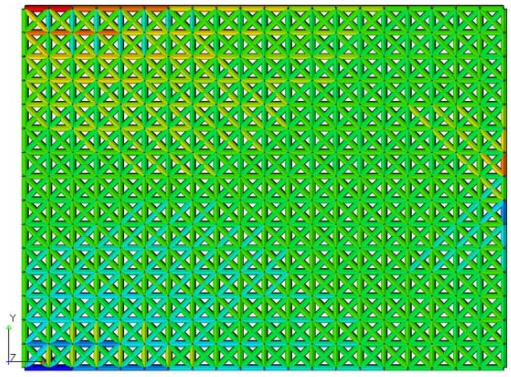


6 Postprocessing Enhancements

1. Bar Force/Stress Postprocessing. Now Bar element stresses and forces are read from post-processing files and can be selected for Color Mesh post-processing.

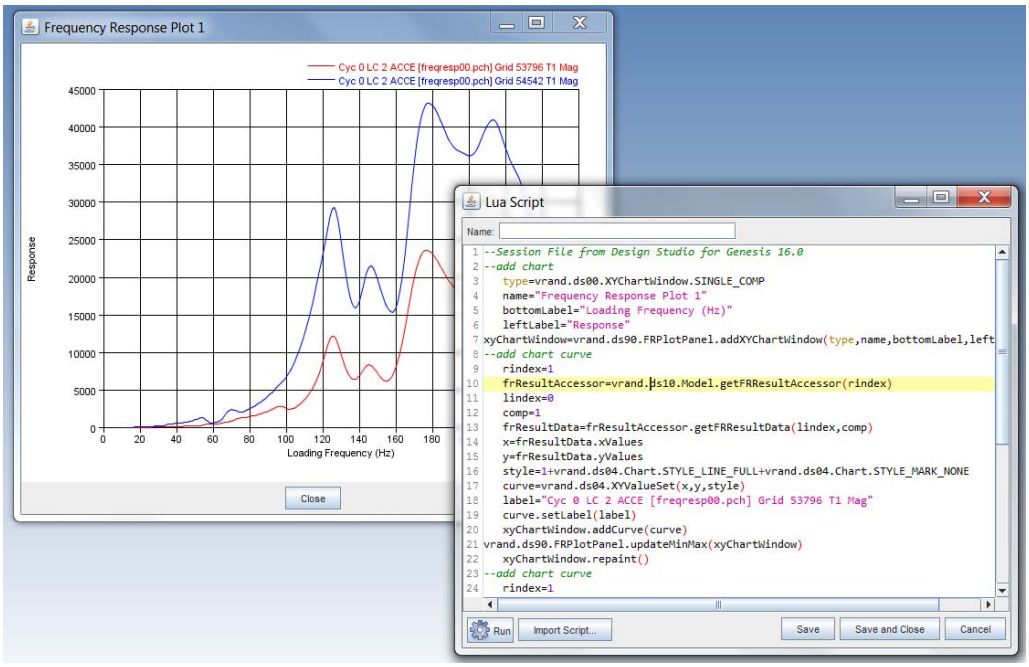


Cycle 0 Loadcase 1 Bar Stress Max Absolute Value



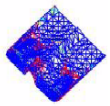
Cycle 0 Loadcase 1 Bar Force Axial End A

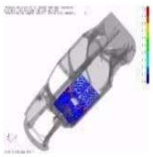
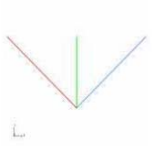
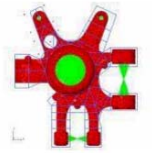
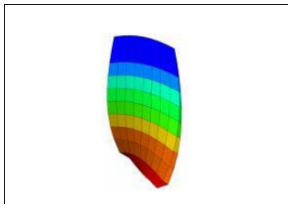
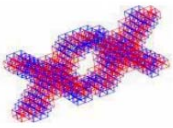
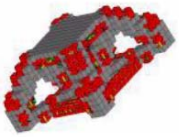
2. Lua Scripting Enhancements. Now creating and editing frequency response plots can be performed by Lua scripts. Using script recording while manually working with frequency response plots will generate the equvalent lua script statements.

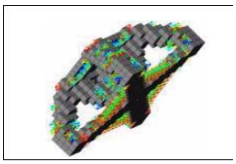


7 New Example Problems

The following table describes new examples and their corresponding input file names. The listed files are provided with the installation:

Name	Problem	Special Features	Figure
TPDSG033.dat	Cloning Topology Design Over Different Models	• Using different types of materials • Multiple models in same input file	
TPDSG034.dat	Casting with No Hole option	• Filling constraint with no through holes	
TPDSG035.dat	Topology Optimization with Heat Transfer	• With steady state heat transfer loading	
TPDSG036.dat	Topology Optimization based on thermal-mechanical loading	• Topology with both heat transfer and static loadcases	
TPDSG037.dat	Topology Optimization to minimize Heat Transfer Compliance	• Minimize heat transfer compliance	

Name	Problem	Special Features	Figure
MMDSG001.dat	Topology Optimization Multi-Models	• Using multiple models	
RBDSG001.dat	Sizing Optimization of Three Rod Truss	• Use of probablility of failure constraints	
RBDSG002.dat	Shape Optimization of Knuckle	• Use of probablility of failure constraints	
RBDSG003.dat	Sizing Optimization of Turbine Blade - Normal Modes	• Use of probablility of failure constraints	
PBDSG001.dat	Lattice Design from Topology Optimization Results	• Lattice Bar Model from solid topology results • Topology optimization on the lattice	
PBDSG002.dat	Topometry Optimization of Lattice Model Generated from Topology Optimization Results	• Lattice Bar Model from solid topology results • Topometry optimiza- tion of the lattice bars	

Name	Problem	Special Features	Figure
PBDSG003.dat	Bar Sizing Optimization of Lattice Model Generated from Topology Optimization Results	• Lattice Bar Model from solid topology results • Sizing Optimization of the lattice bars	

8 Compatibility with Previous Versions

1. Design Studio database files (*.dsg) written with version 15.0 or earlier are compatible with version 16.0. However, database files written with version 16.0 are not compatible with previous versions.