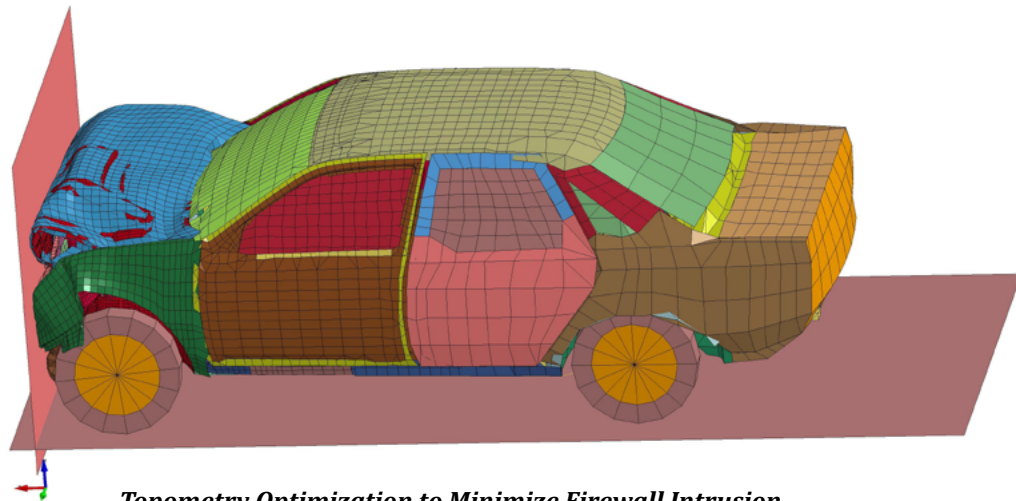


ESLDYNA

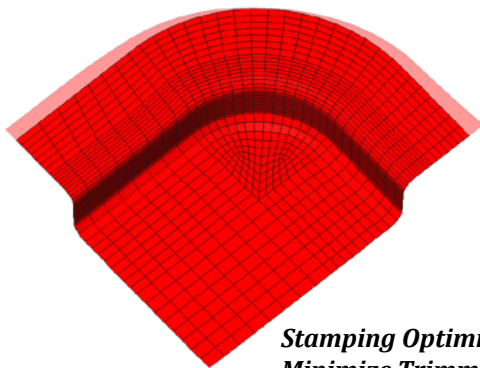
*Optimization Software that Couples GENESIS to
LS-DYNA Nonlinear Structural Analyses*

ESLDYNA is based on the Equivalent Static Loads (ESL) method to perform optimization based on a nonlinear finite element analysis with GENESIS as the structural optimization program. ESLDYNA takes advantage of the capability of GENESIS, a linear structural optimization program, to solve large scale optimization problems based on the responses from a nonlinear finite element analysis. It also helps to significantly reduce the design time by identifying high performance designs with five to ten nonlinear analyses.

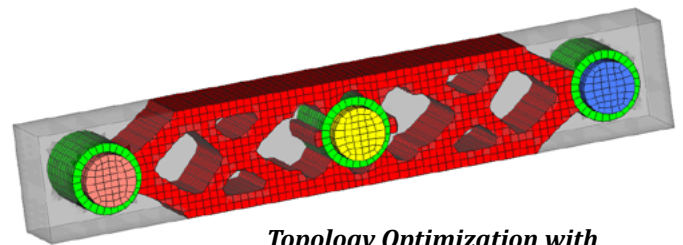
Vanderplaats Research & Development, Inc. (VR&D) provides ESLDYNA which uses LS-DYNA, a product of the Livermore Software Technology Corporation, for the nonlinear analysis. Most of the different types of design optimization techniques in GENESIS are available to the user for designing the nonlinear model. Multiple loading conditions in the nonlinear analysis, using several LS-DYNA input files, can be analyzed simultaneously to achieve optimal solutions. The available plug-in to Design Studio, a design pre- and post-processor, provides an easy to use interface with seamless integration between GENESIS and LS-DYNA.



Topometry Optimization to Minimize Firewall Intrusion



Stamping Optimization to Minimize Trimming Waste



Topology Optimization with Fabrication Constraints

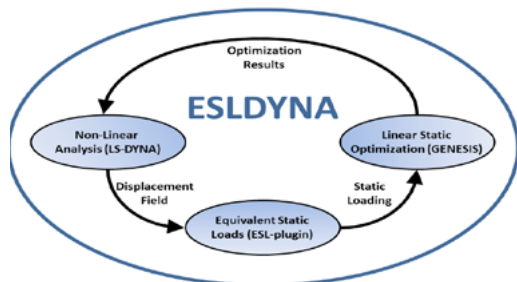
Highlights

- ESLDYNA Optimization can handle a very large number of design variables
- Reduced computational cost
- Ease of use enhanced by the Design Studio plugin
- Seamless integration between LS-DYNA and GENESIS
- Easy implementation of Shape, Sizing, Topology, Topometry, Topography, and Freeform design changes
- Combination of multiple linear (GENESIS) and nonlinear (LS-DYNA) loading conditions
- Ability to transfer data between dissimilar LS-DYNA and GENESIS finite element meshes



ESLDYNA Methodology

ESLDYNA is an implementation of the ESL method for coupling a nonlinear analysis with a linear optimization software for designing the nonlinear model. ESLs are defined as a set of static loads that produces the same response field as obtained in the nonlinear analysis. These loads are used to perform the optimization on the linear model. Optimization results are updated in the nonlinear analysis and a new response field is generated. This process is repeated until design convergence. In case of a transient nonlinear analysis, the time domain is discretized and applied as multiple loadcases on the linear model.



Multiple loading conditions from the nonlinear analysis can be simultaneously considered for the optimization. Each loading condition would be applied as separate loadcases on the linear structural model. ESLDYNA facilitates simultaneously running multiple LS-DYNA analyses to reduce overall design time. Most of the optimization features that are available in GENESIS can be used in ESLDYNA.

Other VR&D Products

GENESIS - Structural Analysis & Optimization

GENESIS is a fully integrated finite element analysis and design optimization software package. Analyses include static, normal modes, direct and modal frequency analysis, random response, heat transfer and system buckling. Design optimization is based on the advanced approximation concepts approach to find an optimum design efficiently and reliably. Actual optimization is performed by the well established DOT and BIGDOT optimizers, also from VR&D. Design capabilities include: topology, shape, sizing, topography, topometry, and freeform optimization. Typically the optimization requires less than ten detailed finite element analyses, even for large and complex design tasks.

Design Studio for GENESIS

Design Studio for GENESIS is a design oriented pre- and post-processor graphical interface for the GENESIS program. It features built-in and easy-to-use trails for setting up the optimization problem and running GENESIS from the interface. It also supports post-processing of the optimization results with contour plots, deformed plots, animations, etc.

Other VR&D Products Cont.

GSAM - GENESIS Structural Optimization for ANSYS Mechanical

GENESIS Structural Optimization for ANSYS Mechanical (GSAM) is an integrated extension that adds topology, topography, freeform, sizing, and topometry optimization to the ANSYS environment. Designers benefit by automatically generating innovative designs in a reliable, robust and easy-to-use interface. The extension allows the user to setup the structural optimization problem, optimize, post-process, export optimized geometry all within the ANSYS environment.

GTAM - GENESIS Topology for ANSYS Mechanical

GENESIS Topology for ANSYS Mechanical (GTAM) is an integrated extension that adds topology optimization to the ANSYS environment. GTAM is a subset of GSAM. GTAM is limited to topology only.

VisualDOC - Multidiscipline Design Optimization

VisualDOC is a software system that simplifies adding optimization to almost any design task. It uses a powerful intuitive graphical interface, along with gradient based and non-gradient based optimization, response surface (RS) approximate optimization, and design of experiments (DOE) methods. VisualDOC interfaces easily to your own code or third-party analysis program. For example, VisualDOC can be easily coupled with ANSYS Workbench.

DOT - Design Optimization Tools

DOT is a general purpose numerical optimization software library which can be used to solve a wide variety of nonlinear optimization problems.

BIGDOT

BIGDOT is intended to solve very large, nonlinear, constrained problems where gradient information is available, and function and gradient evaluation is efficient. BIGDOT is capable of solving continuous, discrete/integer or mixed variable problems. Problems in excess of three million variables have been solved by BIGDOT.

SMS Fast Eigensolver

The SMS eigensolver may be added to existing NASTRAN installations to offer significant performance advantages over the default method when a large number of eigenmodes are required for a system with many degrees of freedom. Benchmark studies and user experience show 2-10 times speedup. SMS may also be embedded into your product/software.

About Vanderplaats Research & Development, Inc.

Vanderplaats Research & Development, Inc. (VR&D) mission is to provide the best technology, software, staff of experts and client support in the optimization world. The company was founded by Dr. Garret Vanderplaats, one of the best known experts in the optimization world. VR&D has a track record for consistently delivering a competitive advantage to customers in a broad range of industries.

Headquarters: 1767 S. 8th St. Suite 200 Colorado Springs, CO 80905

Ph. 719-473-4611 Fax. 719-473-4638 Email: sales@vrand.com www.vrand.com

Michigan office: 41700 Gardenbrook Suite 115 Novi, MI 48375

Ph. 248-596-1611 Fax. 248-596-1911

VisualDOC, GENESIS, SMS, DOT, and BIGDOT are trademarks of VR&D, Inc.
LS-DYNA, is a trademark of Livermore Software Technology Corporation

