LMS Solutions Guide

LMS Virtual.Lab Optimization

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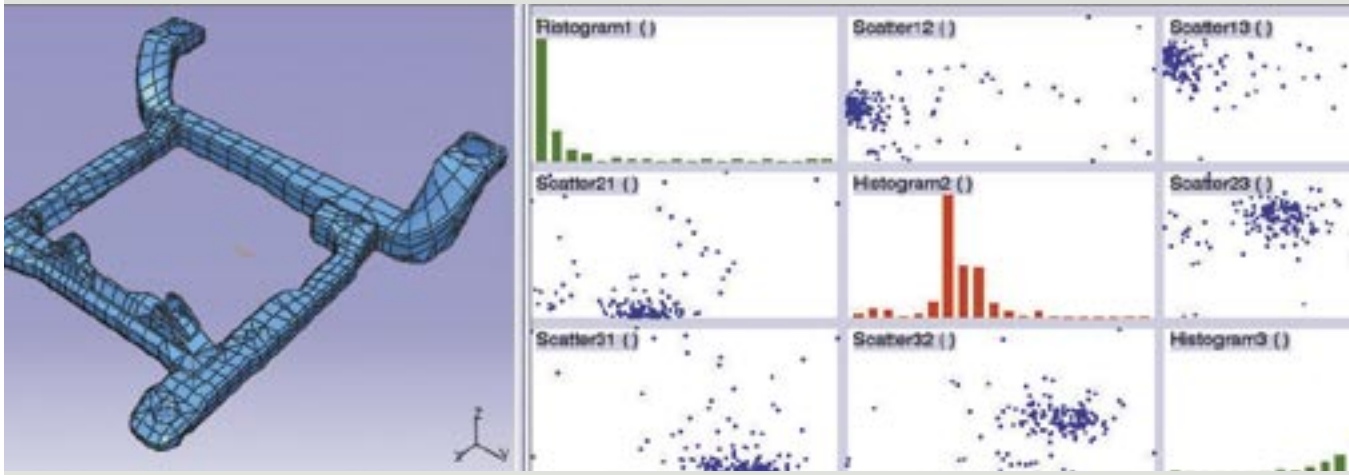
Empowering Engineering Innovation

LMS Virtual.Lab Optimization

Quickly Exploring the Design Space



Optimization offers an integrated set of powerful capabilities for single and multi-attribute optimization. Through Design of Experiments (DOE) and Response Surface Modeling (RSM) techniques, engineers gain a rapid insight in all the possible design options that meet their requirements. Using advanced Optimization routines, Virtual.Lab automatically selects the optimal design, taking into account its sensitivity to real-world variability, and meeting the strictest robustness, reliability and quality criteria.

Process Automation

This module allows users to define design objectives, the design parameters and their distribution. It automates the Optimization loops by monitoring the whole process and by eliminating tedious trial-and-error tasks in engineering design analysis and process planning. “Virtual” experiments are submitted and the results can be visualized through various Response Surface Modeling techniques.

Design Space Exploration

Design Space Exploration allows the user to automatically explore and visualize the design space through the use of a wide variety of Design Of Experiments techniques. The results of these experiments (such as parameter contributions, design sensitivities and correlation plots) give critical insight into the variations of a design and the related ‘trade-offs’.

Optimization – NLP

The Optimization – NLP module allows users to intelligently drive and optimize LMS Virtual.Lab simulation processes. An optimal design can be found using a variety of optimization methods based on Non-Linear Programming techniques, including Sequential Quadratic Programming and Generalized Reduced Gradient methods.

Optimization – Global

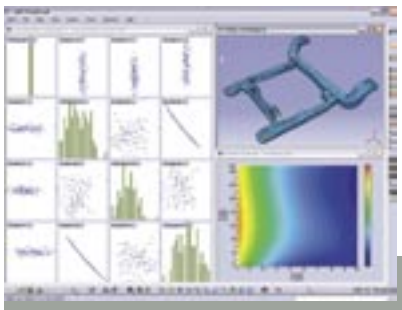
With the Global Optimization module, three different state-of-the-art algorithms - Differential Evolution (DE), Self-adaptive Evolution (SE) and Simulated Annealing (SA) - are available for solving general constrained optimization problems. The above algorithms have a high probability of efficiently finding a global optimum.

Optimization – Discrete

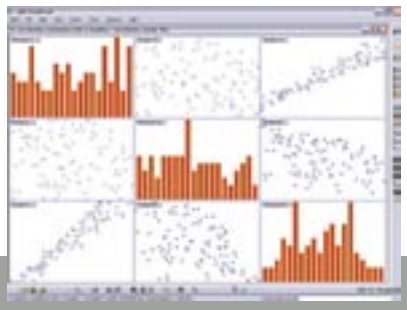
Discrete Optimization solves general constrained optimization problems including a mixture of continuous and discrete variables. Some design parameters can only take integer values or can be chosen from a limited list, such as for sheet metal thicknesses. A choice of discrete variables is available: either integer values only, or a catalog of real values, or a list of strings. Special optimization search routines effectively take into account the discrete character of the input variables.

Robust Design and Variability

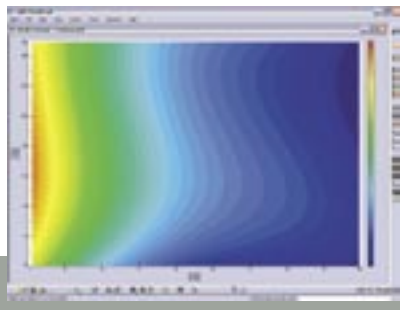
In today's highly competitive world an optimal design is pushed close to the design limits. Due to tolerances on the design parameters, a response cannot be considered as a single deterministic value. Input parameters are to be considered as distributions instead. As a consequence, any variation of a design around its optimal value has to be evaluated in order to meet the desired robustness, reliability and quality criteria.



Plots showing scatter of experiments and sensitivity of Design Parameters in contour diagrams.



Plot showing scatter of different experiments, part of DOE.



Contour diagram highlighting sensitivity of design parameters with respect to design target.

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