dynardo
dynamic software & engineering

SoS – STATISTICS on STRUCTURES

Statistics on Structures (SoS) is DYNARDO Austria's software for visualization of statistical data, evaluation, analysis and simulation of spatially distributed random effects on finite element structures.

Robustness evaluation in virtual product development

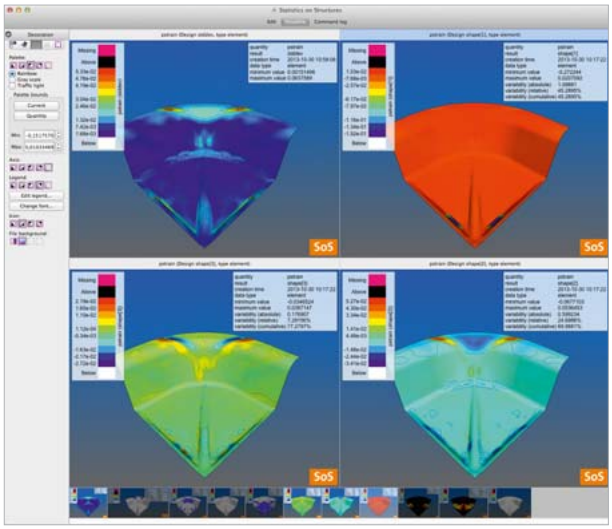
Some properties of engineering structures or structural parts are of random nature due to manufacturing tolerances, material scatter or random loads. For the assurance of product quality, avoidance of recalls and fulfillment of safety requirements, such randomness has to be taken into account by applying appropriate statistical modeling. Spatially distributed random properties are interpreted as random fields in this context.

DYNARDO developed the software Statistics on Structures (SoS) which is capable of decomposing random fields by Karhunen-Loeve expansion, visualizing the identified "scatter shapes", analyzing random properties on FEM structures, locating "hot spots" of variation and investigating correlations.

SoS can be used as a "post processor" for statistics on FEM structures, i.e. for visualization of the descriptive statistics on the structure, for visualization of correlations between random input and structural results as well as for visualization of quality performance (QCS).

SoS can be coupled with optiSLang to investigate the nonlinear correlation structure between inputs and outputs. It can read and write optiSLang binary files integrating optiSlang's MOP solver easily into the analysis of correlation.

SoS can be further used to simulate random fields in a numerical robustness evaluation, i.e. it generates spatially distributed fields (random geometry perturbations, shell thickness perturbations, pre-damage perturbations, etc.) to be used in a robustness study.



Post processing window

Visualization

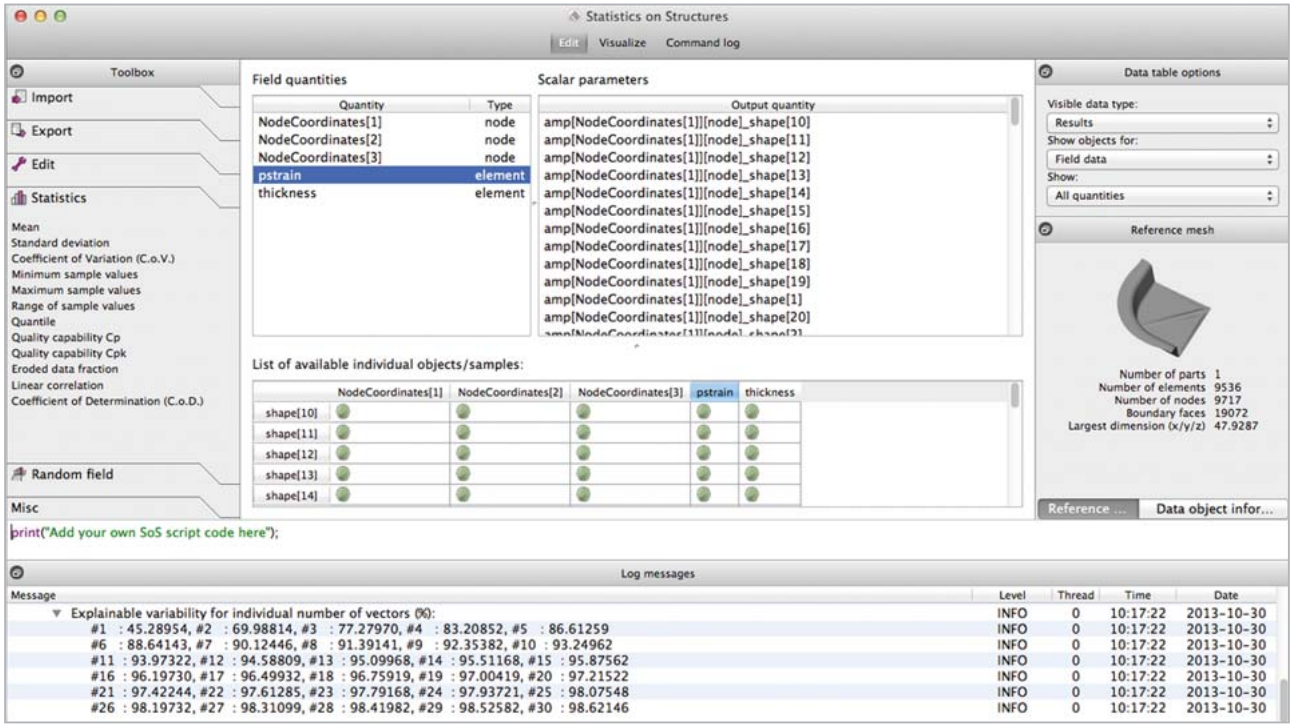
The visualization of statistical quantities on FEM meshes may significantly simplify the evaluation of robustness. In particular, it helps if the critical regions are a priori not known or if their positions vary randomly (eg. in crash simulation, metal forming simulation, etc.). This also increases the acceptance of statistical results in CAE and production departments.

Why Statistics on Structures?

- Analysis of random properties of structures
- Identification of consequences of manufacturing tolerances and random loads
- Inspection of statistics directly on the structure
- Easy detection of hot spots and potential failure locations
- Improvement of robustness and product quality
- Understanding of the cause of scatter
- Decomposing of response scatter using random field parametric
- Generation of random designs by using the random field parametric
- Elimination of random noise in consecutive analysis

SoS – STATISTICS on STRUCTURES

Statistics on Structures (SoS) is DYNARDO Austria's software for visualization of statistical data, evaluation, analysis and simulation of spatially distributed random effects on finite element structures.



Graphical user interface

Features

- Very flexible and easy use of the graphical interface
- Powerful and highly configurable 3D graphics
- Descriptive statistics (mean value, standard deviation, CoV, linear correlation, etc.)
- Value bounds (min, max, range)
- Statistical quality and robustness measures (QCS, quantiles, exceedance probability, etc.)
- Identification of spatial correlations of random fields: Karhunen-Loeve expansion (compute amplitudes and scatter shapes)
- Generation of random field samples
- Elimination of random noise (stochastic smoothening)
- Treatment of failed designs and statistical outliers
- Eroded element frequencies (crack statistics)
- Detection of geometric deviations between non-matching meshes
- Identification of hot spots
- Export selected hot spots or random field amplitudes to optiSLang's MOP
- Import and export of FEM field data (element data or node data, e.g. from FEM simulations of parameter studies) and of scalar parameters (e.g. varied random inputs)
- Visualization of single design and computed field data
- Embedded scripting using Lua language

Wagenseilgasse 14 • 1120 Vienna • phone +43 (1) 997 1207-10 • contact@dynardo.at • www.dynardo.at