

New Features in LS-OPT® V5

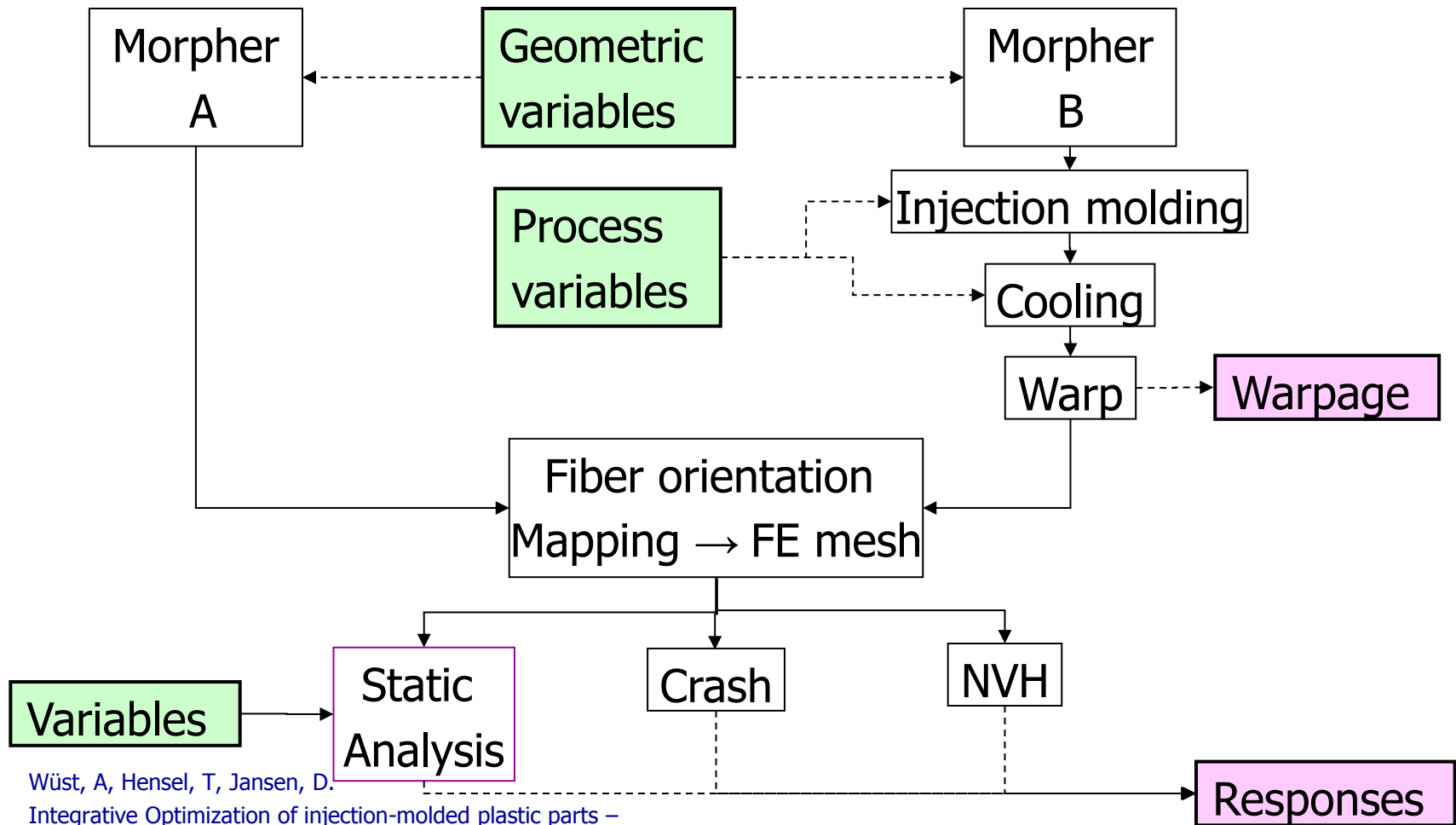
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Overview

- Introduction: Goals
- Example: Manufacturing process
 - Demonstration
- Other new features
- Outlook

Process modeling



Wüst, A, Hensel, T, Jansen, D.

Integrative Optimization of injection-molded plastic parts –

Multidisciplinary shape optimization including process induced properties.

Proceedings of the 7th European LS-DYNA Conference, Salzburg, Austria, May 14-15, 2009

Principal Goals

- Provide a capability for simulating and optimizing a multidisciplinary process.
- Handle job flows that merge and branch. Providing a tree structure is not sufficient.

Principal Goals

- Streamline job load balancing by allowing independent global resource definitions.
 - Removes limits on multi-case parallel simulations: improves throughput
 - Any number of resource types per stage
 - Applies to license limits, processor limits, memory limits, disk space, ...

Principal Goals

- Increase transparency
 - Show progress at all phases: simulation, optimization, ...
 - Modernize solver job progress
 - Track design parameters and their sources
- Simplify data flow:
 - Support for file operations: copy, move, delete.

Goals (contd.)

- Simplify variable reduction and restart
 - Seamless interface for variable screening and optimization
 - Re-select variables and continue next iteration

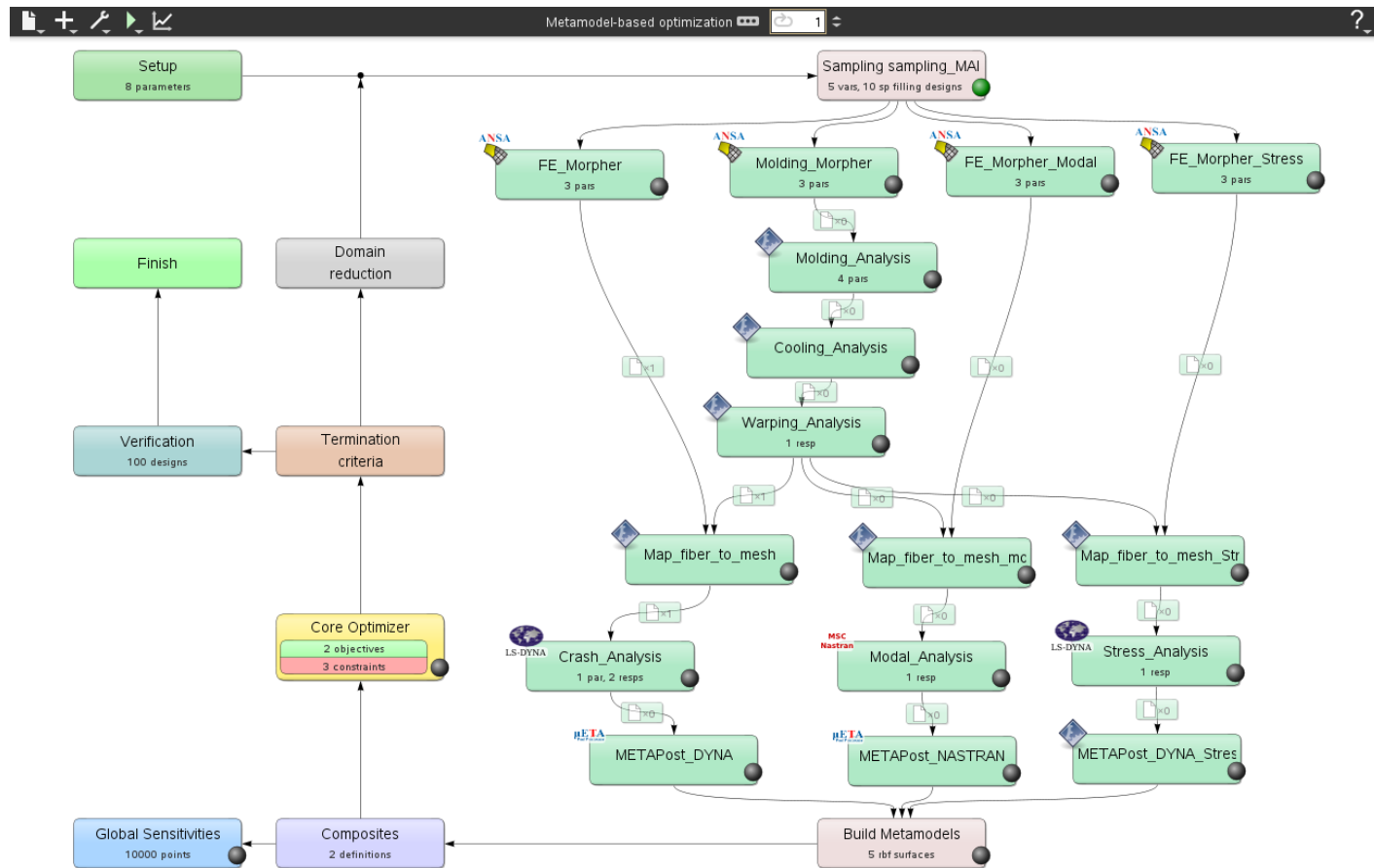
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Warning: Variable R is not used in any sar

Goals (contd.)

- Minimize keystrokes
 - “Replace” (save) rescinded
 - Economy of selections
 - Dual function buttons
 - Omission of redundant options improved
- View multiple windows
 - GUI, progress (stage-based) and processing at the same time

Flowchart of an injection molding example



Integrative optimization of injection-molded plastic parts
/home/nielen/LSOPT/FUTURE/optQA/PROCESS_SIMULATION/BASF/DEMO/3/basf3 Isopt

Demonstration

- Large example

[LS-OPT Example](#)

- Set up an example from scratch

[LS-OPT Setup](#)

- Run a process

[LS-OPT Run](#)

Other new features in LS-OPT V5

- Support for string variables and constants. Both in LS-OPT and LS-DYNA

Type	Name	Starting	Init. Range	Minimum	Maximum	Sampling Type	Saddle Direct...	De...
String	MaterialA	Y200	Values: Y200, Y250, Y275, Y300, Y500,				Minimize	▼ ×
Discrete	Thickness	1.2	Values: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6			Discrete	Minimize	▼ ×
String	MaterialB	R100	Values: R100, R125, R130, R160,				Minimize	▼ ×

Add ...

OK

Other new features in LS-OPT V5

- Support Vector Regression as a metamodel
 - Precursor to multiple surrogates – to automate metamodel choice

LS-OPT[®] Version 5:

OUTLOOK

Outlook (Version 5.1)

- Excel stage type
 - Support Excel formulas as a response type
 - Typically used as a postprocessor
- Deactivation of variables
 - Already available in v5.0
 - Adding seamless deactivation between iterations

Outlook (Version 5.1)

- Mathematical formulas of metamodel functions
 - Initially support polynomials and RBFNs
 - Can be used for e.g. Matlab plotting
- Global sensitivity analysis in sub-domain of design space
 - Simple subdomain bounds
 - Irregular subdomain bounds

Outlook (Version 5.1)

- Response variables
 - Transfer of output variables (responses) from one stage as input variables to the next stage
 - Can generate new parameters in any stage of the process flow

Outlook (Version 5.1)

- Multi-level optimization
 - Define an optimizer as a stage
 - Involves nesting of LS-OPT

Outlook (Version 5.1)

- Collaborative optimization
 - De-activate selected cases in the MDO problem
 - Allows synthesis and decomposition of MDO setup
 - Import metamodel for selected case

Longer term developments

- Parallelization of LS-OPT
 - Especially useful for generating expensive metamodels, such as FFNN
- Enhanced Global Optimization (EGO)
 - Established, Kriging-based global optimizer based on the probability of finding an improved solution
 - Iterative in nature
 - Facilitates search for multiple local optima