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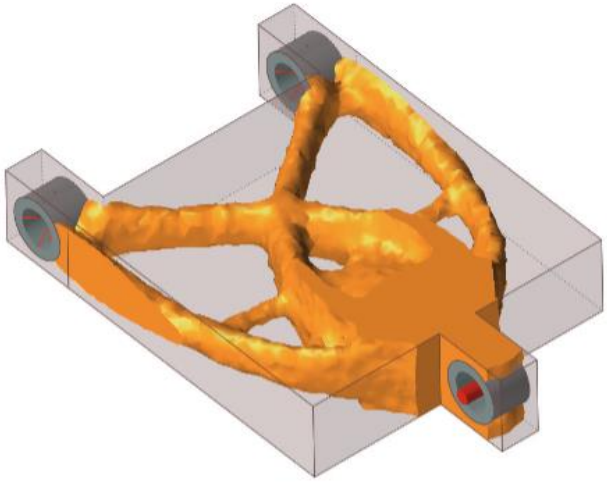
Paris, September 18th, 2014

Presentation

INSPIRE

solidThinking / WHERE IDEAS TAKE SHAPE

Topological optimization software



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solidThinking Inspire® is a topological optimization software. It offers users a new way to design, produce shapes or geometries to lighten the object. It helps designers in the preliminary project phase, through a new approach to change design strategies.

This new approach is the inverse of the traditional numerical simulations which indicate whether a piece withstands loads applied to it.
INSPIRE guide designers towards a different design using loads as input. These data allow the software to generate a new geometry where the material will be distributed optimally in a given functional area.

solidThinking Inspire® enables design engineers, product designers, and architects to create and investigate structurally efficient concepts quickly and easily. Inspire uses the Industry leading Altair OptiStruct® technology to generate design concepts. The software is easy to learn and works with existing CAD tools to help design structural parts right the first time, reducing costs, development time, material consumption, and product weight.

- **Design Faster**

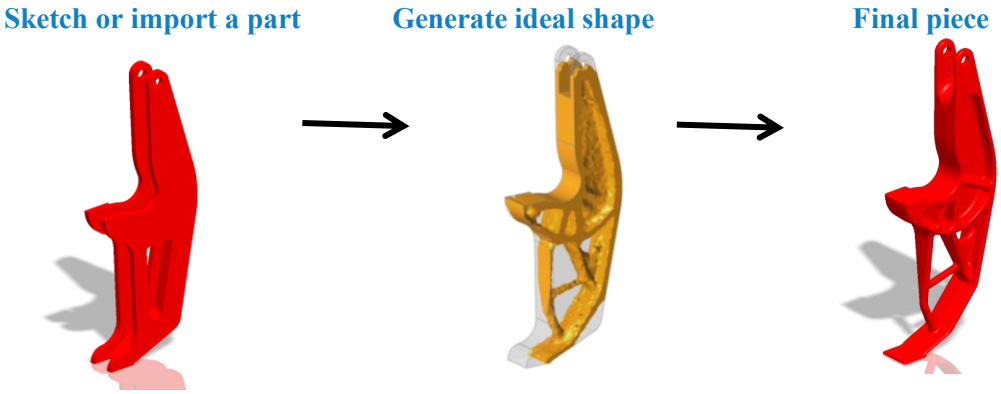
Generate concepts which meet structural performance requirements at the beginning of the design cycle. This results in significant time savings over the traditional approach of design, validate, redesign to meet structural requirements.

- **Design Smarter**

Inspire makes it easy to perform “what-if” scenarios where package space, connections, load conditions, and shape controls can be modified. Reviewing the resulting concepts often reveals valuable insights...

- **Design Lighter**

Inspire makes efficient use of material, only placing it where required to satisfy structural performance requirements. Reduced design weight leads to material cost savings, performance improvements and reduced shipping costs.



PROCESS

View the Inspire 2014 workflow above.

1. Geometry Creation and Simplification

Create, modify, and de-feature solid models using Inspire's modeling tools:

- **Sketch Tools** – Build or modify parts by sketching lines, rectangles, circles, and arcs. Geometric constraints such as tangency and perpendicularity can also be applied.
- **Trim/Break** – Cut and remove sketch curves at the point of intersection.
- **Push/Pull** – Extrude flat or cylindrical faces to create solid parts or holes, modify dimensions.
- **Boolean Operations** – Add, subtract, or intersect solid parts to create more complex geometry.
- **Defeature** - Remove imprints, rounds, fillets, holes, and pockets, or plug holes and pockets, or create patches and bridges.

2. Manufacturing and Shape Controls

Generate design concepts that are not only structurally efficient but also manufacturable using Inspire's shape controls:

- **Symmetry Planes** – Force asymmetric design spaces to generate symmetric optimized shapes.
- **Cyclic Repetition** – Create cyclically repeating shapes like propellers or wheels.
- **Draw Directions** – Generate shapes that can be easily molded or stamped by applying single or split draw directions.
- **Extrusion Shape Control** - Generates constant cross-section topologies in a specified direction.
- **Customizable Materials Database** – Inspire is packaged with a material library including various aluminum, steel, magnesium, and titanium alloys. Custom materials can also be added.

3. Optimization Options

Inspire offers users a number of topology options:

- **Optimization Objectives** - When running an optimization, Designers can choose to either maximize stiffness or minimize mass.
- **Stress Constraints** - A global stress constraint can be applied to limit the maximum stress in the model during optimization.
- **Displacement Constraints** – Displacement constraints can be applied to a model to

limit deflections in desired locations and directions.

- **Smoothing** - surfaces can be smoothed to avoid designers to rework the piece on CAD software.

4. Analyze

The last INSPIRE 2014 allows to evaluate the performance of concepts generated by the software using finite element calculations.

- **Mesh** - Define mesh elements size
- **Results** - Investigate linear static and normal modes analysis on a model and visualize displacement, factor of safety, percent of yield, tension and compression, von Mises stress, and major principal stress.
- **Animation** – Enable to view the part deformation

SPECIFICATIONS

- **Multiple Language Formats**

Chinese, English, French, German, Italian, Japanese, Korean, Portuguese, Spanish

- **Shape Controls & Design Constraints**

- Min/Max Size
- Draw Direction
- Symmetry
- Pattern Repetition
- Cyclic Repetition
- Stress Constraints
- Frequency Constraints
- Displacement Constraints

- **Geometry Import**

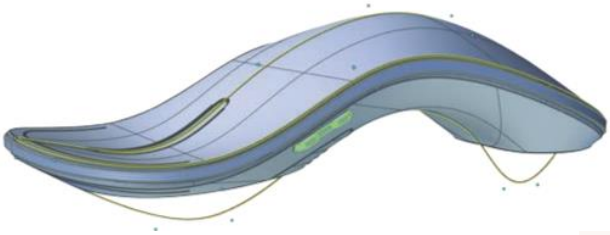
- ACIS
- Catia (V4 & V5)
- JT
- Parasolid
- Pro/E
- SolidWorks
- IGES
- STEP
- STL

- **Geometry Export**

- IGES
- Parasolid
- STEP
- STL

EVOLVE

EVOLVE is a 3D modeling and rendering software and is part of the solidThinking Suite. The solution is ideal for the creative community (automotive industry, jewelry, art…) and is one of the most popular design software is Italy. It completes INSPIRE as you can work on design of models that have been optimized by the latter. It enables you to capture an initial sketch, explore styling alternatives, and visualize products with realistic renderings generated in real time. . It frees designers from the constraints of engineering-oriented CAD tools, while allowing the export of digital models required by others in the product development process.



solidThinking INSPIRE is the entry point to Multistation's "progressive design and lattice engineering" offer as topology optimization is key to additive manufacturing.