

From 3D Images to Simulation with Simpleware and Abaqus

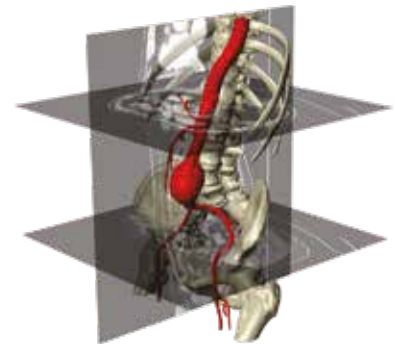
Simpleware software provides solutions for generating high-quality models from 3D image data (MRI, CT, micro-CT, FIB-SEM...) for direct export to Abaqus software for very realistic simulations. This solution is smooth and robust for workflows using complex image data, and opens up a wide range of applications for Abaqus users needing a straightforward route from scan to CAD, FEA and CFD.

Simpleware Key Benefits

- Work with wide range of 3D image data and CAD files
- Fast and time saving workflow
- Easy-to-use and intuitive interface
- Customizable, including scripting
- Industry-leading mesh quality
- Dedicated Abaqus exports
- Extensive technical support and consulting services

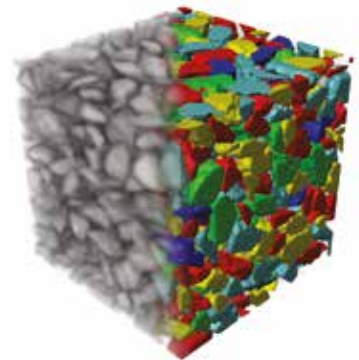
Simpleware Features

- Automated multi-part meshing for structural FEA and CFD
- Fix models (dirty CAD, orphan/deformed meshes, Booleans...)
- Rapid image data visualization and animation in 2D and 3D
- Comprehensive image processing & analysis tools
- CAD integration & NURBS export
- FE-based homogenization modules



Selection of Application Areas for Abaqus Users

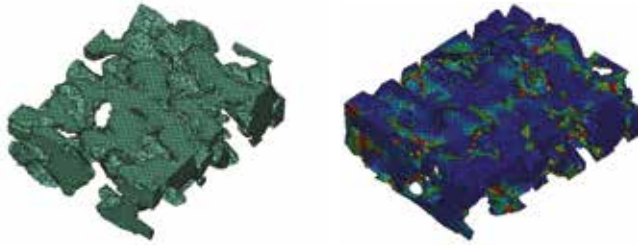
- | | |
|---|---|
| <ul style="list-style-type: none"> • Life Sciences
e.g. medical devices, orthopedics, physiological flows... • Materials Science
e.g. alloys, composites, soils, concrete, porous media, plastics, rubbers... • Reverse Engineering
e.g. automotive, aerospace, consumer and legacy products... | <ul style="list-style-type: none"> • Industrial NDT
e.g. product design, industrial filters, fuel cells, batteries, welds... • Oil & Gas
e.g. digital rock physics, special core analysis, geophysics field data... • Synthetics
e.g. textiles, ceramics, insulation materials, fibres... |
|---|---|



Stress Analysis of Fuel Cell Microstructure

R. Clague¹ • P.R. Shearing¹ • P.D. Lee¹ • Z. Zhang¹ • D.J.L. Brett² • A.J. Marquis¹ • N.P. Brandon¹

¹Imperial College, London, UK; ²University College London, London, UK



FE mesh and 3D max principal stress in Abaqus

Solid oxide fuel cells (SOFCs) can be virtually analyzed to predict stresses within different material phases. Simpleware software was used to reconstruct a complex SOFC microstructure (nickel and yttria-stabilized zirconia) from FIB tomography and export volume meshes to Abaqus for 3D FE stress analysis across the phases and interfaces of the fuel cells. The analysis found that the yield strength of the nickel in the fuel cell is exceeded at the interface of the two phases, suggesting its importance for stress relief in the electrodes as they are heated or cooled.

3D FE Model of the Diabetic Neuropathic Foot

A. Guiotto • Z. Sawacha • G. Guarneri • A. Avogaro • C. Cobelli

University of Padova, Padova, Italy



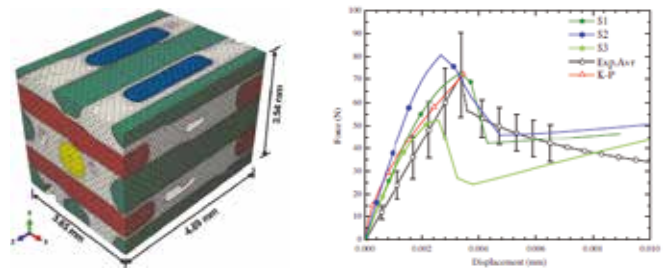
3D mesh of foot and simulated plantar pressure in Abaqus

Diabetic foot represents a complication of diabetes that can lead to foot ulcers and other serious conditions. 3D FE modeling was used in Abaqus to dynamically characterize different loads within the foot. Simpleware software was used to develop a subject-specific 3D FE model of a diabetic neuropathic and a healthy subject's foot from MRI data, and to generate a high-quality mesh with conforming interfaces for simulation in Abaqus. Results agreed well with experimental tests using kinematics and kinetics data.

Non-Destructive Evaluation of Carbon/Carbon Composite

P. Mahajan • R. Kumar Mittal • A.R. Bhaghat • V.V. Deshpand • R. Sharma

Indian Institute of Technology, Delhi, India



FE mesh of composite and load displacement curves

Carbon/carbon (c/c) composites are valuable for automotive, aerospace and other industries due to having excellent mechanical properties at high temperatures whilst still being lightweight. This study used Simpleware software and Abaqus to analyze the effect of internal damage from voids, cracks and distortion caused during manufacturing. X-ray CT scans were processed in Simpleware software to reconstruct and segment scans of composites, and to generate FE meshes for simulation of stresses in Abaqus, leading to better understanding of future material designs.

Simpleware Software Solutions

The Simpleware product group at Synopsys develops software for the conversion of 3D scan data (MRI, CT, micro-CT...) into high quality design, simulation and 3D printing models. Simpleware software is used in fields such as the Life Sciences, Materials Science, Industrial Reverse Engineering, NDE, and Oil and Gas. Easy-to-learn and use, the software offers a robust bridge between the latest imaging technologies and multiple design and simulation applications.

For more information go to www.simpleware.com

Synopsys (N.E.) Ltd
Bradninch Hall, Castle Street
Exeter, Devon
EX4 3PL, UK

International Sales: +44 (0)1392 428 750

U.S. Sales: +1 (443)-741-3327

India Sales: +91 (0)820-9681120

Email: simpleware@synopsys.com

SYNOPSYS[®]

©2017 Synopsys, Inc. All rights reserved. Synopsys is a trademark of Synopsys, Inc. in the United States and other countries. A list of Synopsys trademarks is available at <http://www.synopsys.com/copyright.html>. All other names mentioned herein are trademarks or registered trademarks of their respective owners.
09/01/17.CS11675_Simpleware_Abaqus_Brochure.