

Design+Analysis

VISITING LECTURE

“The Finite Cell Method and its application to the material characterization of additively manufactured microarchitected structures”

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Simulation in Applied Mechanics
Computational Modelling and Simulation
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Tuesday the 14th of April 2020 at 2 pm
e-lecture via Zoom

<https://tum-conf.zoom.us/j/943148592?pwd=cE5YSWxwQlk0S2ozWk42Uk5RNjEUT09>

Abstract: Additive manufacturing has drawn a significant interest in research and industry due to its flexibility in the production of complex shapes. It enables the design and manufacturing of porous microarchitected lattice-like structures with high scale separation. However, the complexity of the manufacturing process brings uncertainty to the material properties of the final product. The mechanical behavior of such structures is highly influenced by the process parameters, process-induced porosity state and geometrical deviations of the internal microstructures.

In this presentation, a developed numerical material characterization workflow for the evaluation of the mechanical parameters of additively manufactured lattice-like metal structures is shown. The numerical analysis is performed on high-resolution 3D images of produced specimens obtained via computed tomography (CT) to account for process-induced geometrical defects. Due to a high scale separation, the quality of the final material characteristics is highly dependent on the numerical resolution of such structures. Therefore, an application of a conventional Finite Element Method is impractical due to the infeasible costs of mesh generation on such scales. Thus, the high-order Finite Cell Method is utilized to establish an efficient extraction of material parameters directly from the provided 3D models stemming from CT-scans or from CAD. In this work, the proposed roadmap is applied to lattice-like additively manufactured specimens and is validated against experimental tests.

We wish you welcome – home-made coffee at 2 pm sharp, the presentation a quarter after the first dose!

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Design+Analysis VISITING LECTURES target for presenting and discussing a diverse collection of topics related to *Computational Structural Engineering* and *Structural Mechanics* from the perspective of *Structural Analysis* and in the context of *Architectural, Industrial and Structural Design*, with a special emphasis on *Theoretical and Applied Mechanics of Solids and Structures*. Accordingly, term *design* – besides architectural, industrial and structural design – refers to designing models and methods, whereas term *analysis* – besides structural analysis – refers to analyzing models and methods.