COLLABORATIVE RESEARCH CENTER 837

INTERACTION MODELING IN MECHANIZED TUNNELING

Research Department
SUBSURFACE MODELING & ENGINEERING

RUB

SFB 837 – WEBINAR: 1 KEYNOTE – 3 LECTURES

INTEGRATION OF CAD & COMPUTATIONAL ANALYSIS – FINITE CELLS VERSUS FINITE ELEMENTS

03.11.2021, 15:00 - 16:30 Uhr

ZOOM WEBINAR:
PLEASE USE THIS LINK
Meeting-ID: 977 0900 8743
Passwort: 656500

KEYNOTE

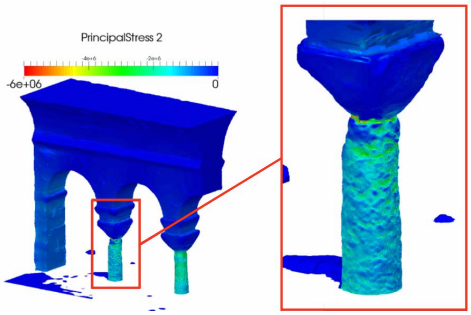
INTEGRATION OF GEOMETRY AND ANALYSIS RE-DESIGNED: THE POWER OF IMMERSED BOUNDARY METHODS

15:00 Uhr

Prof. Dr. rer. nat. Ernst Rank
Computation in Engineering, Technical University of Munich, Germany

In Computer Aided Design, many types of geometric models are used. Most important are Constructive Solid Geometries (CSG) constructing bodies from primitives and Boolean operations, and Boundary representations (B-rep models) describing a geometric object by vertices, edges, loops and surfaces. Completely different model types result from tomographic methods, where a body is defined by a discretized density distribution, or from photographic images yielding point clouds to approximate the surface of a structure. Numerical analysis of solid objects by finite elements needs yet a different description of a geometry, as a mesh must be derived. Despite decades of research, this transition from geometric models to finite element meshes is often time consuming, in particular as in practice models are frequently inconsistent in a strict mathematical sense, meaning that geometric 'healing' has to be performed, before meshing can even start.

In this presentation, we will show how immersed boundary methods significantly simplify a geometry-analysis integration by omitting the necessity of a boundary conforming mesh generation. After an introduction in a specific immersed boundary approach, the Finite Cell Method (FCM), applications to various types of geometric models including questions w.r.t. 'dirty' geometry will be discussed. We will address an analysis of 'as-designed' versus 'as-built' lattice structures produced by additive manufacturing, discuss non-linear fracture problems and finally present an example for a camera-to-analysis workflow, where a point cloud of an object is obtained from photos of a consumer camera and directly transferred to a three-dimensional structural analysis.

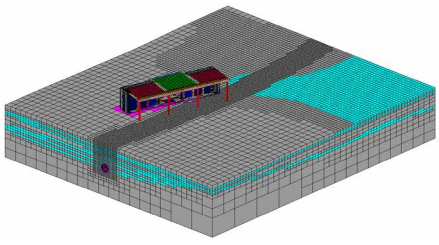


LECTURE

FINITE CELL METHOD IN GEOTECHNICAL APPLICATION: DEVELOPMENT & CASE STUDIES

15:45 Uhr

Ph.D.
Hoang-Giang Bui
Structural Mechanics, RUB, Germany

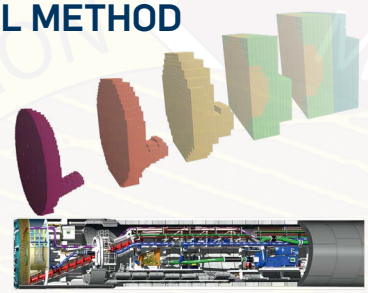


LECTURE

GEOMETRIC MULTIGRID PRECONDITIONERS FOR THE FINITE CELL METHOD

16:00 Uhr

M. Sc.
Poria Saberi
High Performance Computing in the Engineering Sciences, RUB, Germany

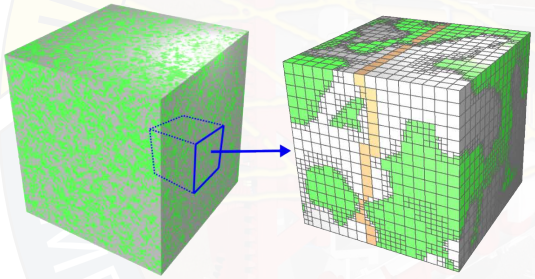


LECTURE

FINITE-CELL-METHOD FOR THE SIMULATION OF DUCTILE CRACK PROPAGATION THROUGH METALLIC MICROSTRUCTURES OF MINING TOOLS

16:15 Uhr

M. Sc. Dennis Wingender
Continuum Mechanics, RUB, Germany



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