

Modelling approaches for continua with advanced microstructure

Scientific area: Computational Solids And Structural Mechanics

Keywords: Advanced Simulation Methods; Modelling Microstructures; Computational Homogenisation; Generalised Continua; Composites; Coupled Problems; Machine Learning.

During recent decades, several continuum modelling approaches have emerged to study the effects of microstructure and of evolving microstructure on the physical behaviour of materials. Of particular interest are tailored microstructures that lead to a locally adapted material response of the global macroscopic domain. Hence, due to the increased design flexibility, more complex microstructural modelling approaches are being developed to capture these distributed effects. Therefore, recent developments in the field of advanced discretization methods have to meet these requirements. For example, one such development is the virtual element method used in computational homogenisation for the study of crystalline microstructures or anyway to ease re-meshing strategies for evolving microstructures. Complexity can increase also at the macroscopic level, for instance adopting generalised continua which consider size effects stemming from the microstructure via higher-gradient contributions. Further modern approaches used to study continua with microstructure are meshfree methods, machine-learning techniques, or partial domain decomposition, as for example global-local approaches, to name only a few. The mini-symposium addresses topics related to the theoretical background of advanced modelling approaches as well as contributions in the context of material modelling with microstructural considerations. Topics include, but are not restricted to:

- Advances in modern discretisation schemes, e.g. the virtual element method, meshfree methods, isogeometric analysis, domain decomposition
- Machine learning techniques to microstructures, i.e. model-data-driven and pure data-driven approaches
- Multi-scale approaches and computational homogenisation
- Generalised continuum approaches
- Applications to coupled problems, composite materials, etc.

This minisymposium aims to provide a platform for researchers of the YIC community to present, exchange and discuss ideas and recent developments in the field. Due to the multidisciplinary nature, it includes works from mathematical and engineering points of view and welcomes contributions from theoretical, computational and applied perspectives.

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