Finite Element Discretization of Digital Material Representation Models

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ABSTRACT

The main aim of the work is presentation of recent development of algorithms for finite element mesh generation that can be further used to investigate materials behavior under loading conditions, on the basis of digital material representation (DMR) concept.

The main objective of the DMR model is to create the digital microstructure with its features represented explicitly during numerical simulation. As a result, a unique possibility to evaluate influence of microstructure morphology on inhomogeneities occurring during material forming under plastic deformation conditions is created.

However, due to large solution gradients occurring along various microstructure elements, often with significantly different properties, the problem of proper finite element mesh generation is off importance. Thus, in the present work particular attention is put on development of conforming meshes for single and two-phase materials.

Two approaches will be presented within the work. The first is based on *a priori* mesh refinement along particular microstructure features. The second, on mesh adaptation techniques based on error indicators. Examples of application of meshes generated with both approaches to micro and multi scale numerical simulations of material deformation will also be presented during presentation.