

Efficient Computational Homogenization of Simple Elasto-Plastic Microstructures Using a Modified Ritz-Galerkin Approach

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ABSTRACT

The presentation concentrates on the application of a numerically efficient approach for the computation of the average stress response of geometrically simple periodic microstructures. The model DOFs are given by a small number of ansatz functions being determined by a geometrical approach, leading to fast solution schemes. Moreover, the total number of stress evaluations in the microstructure is also small compared finite element models. In principle, the method may be used in three-dimensions and for various material models. However, the presentation concentrates on elastic inclusions in an elasto-plastic matrix. In addition, exclusively geometrically linear, plane strain results are discussed. In order to compensate the artificial stress overprediction due to the Ritz-Galerkin scheme, model modifications introduced. The model predictions are validated by comparison to finite element results for several microstructural geometries and material combinations.