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MULTIPLE SCALE REDUCED ORDER HOMOGENIZATION

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ABSTRACT

While computational cost of the direct nonlinear computational homogenization is a small fraction of the direct numerical simulation of a heterogeneous medium with a characteristic mesh size of the heterogeneity order it remains computationally prohibitive for large scale nonlinear problems. In this talk we present a multiple scale reduced order homogenization, which systematically reduces the computational complexity of the nonlinear multiple scale homogenization theory is developed. The so-called N-scale model reduction (NMR) approach is based on reformulating a sequence of nonlinear unit cell problems at multiple scales in terms of inelastic deformation modes that a priori satisfy equilibrium equations at multiple scales and thus eliminating the need for costly discretized nonlinear equilibrium solutions. The N-scale model reduction approach hinges on the following two assumptions: (i) spatial scales are separable at all relevant scales, i.e. multiple scale homogenization theory is valid, and (ii) at the finest scale of interest, the rate of deformation is decomposable into elastic and inelastic (eigenstrains) contributions.

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