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15. Numerical Analysis and Scientific Computing

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Adaptive multigrid methods for Prandtl-Reuß-plasticity
We introduce a multigrid method for finite elements and the application to Prandtl-Reuß-plasticity. The basis for the plasticity computations builds a flexible finite element library which supports adaptive multigrid methods for various discretizations. This is coupled by an abstract interface for the material evaluation by a return mapping function at every Gauß-point. We consider in detail the adaptive process of refinement and derefinement and the required interpolation of the material history. The algorithm is realized with the software package *UG*. This supports parallel multigrid methods on unstructured, locally refined grids with dynamic load balancing. The performance of the algorithm is demonstrated by several examples in 2D with assumed plain strain and in 3D, comparing different material laws (perfect plasticity and exponential hardening).