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Generalized finite element method in structural nonlinear analysis – a p-adaptive strategy.

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Summary: This paper is concerned with an extension of the generalized finite element method, GFEM, to nonlinear analysis and to the proposition of a p-adaptive strategy. The p-adaptivity is considered due to the nodal enrichment scheme of the method. Here, such scheme consists of multiplying the partition of unity functions by a set of polynomials. In the first part, we present the performance of the method in nonlinear analysis of a reinforced concrete beam with progressive damage. The adaptive strategy is then proposed on the basis of a control over the approximation error. Aiming to estimate the approximation error, the equilibrated element residual method is adapted to the GFEM and to the nonlinear approach. Then, global and local error measures are defined. A numerical example is presented outlining the effectivity index of the error estimator proposed. Finally, a p-adaptive procedure is described and its good performance is illustrated by a numerical example.

MSC:

74S05 Finite element methods applied to problems in solid mechanics
74K99 Thin bodies, structures
65N15 Error bounds for boundary value problems involving PDEs

Keywords:

Meshless methods; Error estimation; reinforced concrete beam

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