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High regularity partition of unity for structural physically non-linear analysis. (English)

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Summary: Meshfree techniques, such as *hp*-Clouds and Element Free Galerkin Methods, have been used as attractive alternatives to finite element method, due to the flexibility in constructing conforming approximations. These approximations can present high regularity, improving the description of the state variables used in physically non-linear problems. On the other hand, some drawbacks can be highlighted, as the lack of the Kronecker-delta property and numerical integration problems. These drawbacks can be overcome by using a C^k, k arbitrarily large, partition of unity (PoU) function, built over a finite element mesh, but with the approximate characteristic of the meshfree methods. Here, this procedure is for the first time investigated to simulate the non-linear behavior of structures with quasi-brittle materials. The smeared crack model is adopted and numerical results, obtained with different kinds of polynomial enrichments, are compared with the experimental results.

MSC:

74S05 Finite element methods applied to problems in solid mechanics
65N30 Finite element, Rayleigh-Ritz and Galerkin methods for boundary value problems involving PDEs
74R05 Brittle damage

Keywords:

generalized finite element method; *hp*-clouds method; Partition of unity; C^k functions

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