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Elasto-plastic Fracture Mechanics Simulation Using Partitioned Iterative Coupling Method

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In large-scale elasto-plastic fracture mechanics problems, plasticity remarkably occurs in the crack tip vicinity because of stress concentration, whereas yielding tends to be avoided in a field far from the crack. Partitioned iterative coupling method is effective for such problems. In this method, an analysis model is decomposed into two domains. Plasticity is considered only in the one small domain that contains a crack, whereas the other large domain is an elastic body. The two domains are analyzed separately and repeatedly with an iterative solution technique, and a converged solution that satisfies both geometric compatibility and force balance is obtained. J-integral is evaluated from this solution of the one small domain. In this presentation, an elasto-plastic benchmark problem with a cracked model is analyzed with the partitioned iterative coupling method.

Keywords: Computational fracture mechanics, Finite element method, Large-scale, Three-dimensional, J-integral, Iterative method