LOSS OF HYPERBOLICITY AND CRACK GROWTH

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The concept of governing the propagation of cracks by loss of hyperbolicity are examined. For this purpose, a simple model governed by the Lemaitre damage model is considered. The crack propagation is modeled by the extended finite element method, wherein the crack can move arbitrarily through the mesh without remeshing. At each step of the analysis, the crack is advanced to the point where the ellipticity indicator vanishes, or exceeds zero by a predetermined value. Thus, just as the material loses stability, it transitions to a discontinuous treatment. We examine features of crack propagation such as the speed of the crack, its direction under several loadings, and the tendency toward crack branching.