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STATIC AND DYNAMIC ANALYSIS OF CONCRETE FRACTURE USING LOCALIZING GRADIENT DAMAGE

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When a continuum damage model in a local version is applied in simulations of concrete cracking, it is known that well-posedness of the (initial) boundary value problem can be lost, hence a localization limiter is required, cf. [1]. The model can be regularized by the gradient term via an additional averaging equation according to [2]. From the physical viewpoint it represents microstructure evolution at the macro scale. However, the issue with exaggeratedly broadened damage zone is observed in computations if the internal length scale is assumed to be constant. Among different approaches of implementation of the evolving length scale, the so-called localizing gradient damage model [3] is selected. The localization zone is controlled by a gradient activity function. A decreasing function of gradient activity has a physical motivation, the internal length scale is reduced with the increase of damage as fracture is approached.

The paper shows a comparison of the conventional model [2] and the localizing one [3]. Theoretical frameworks together with finite element formulations are discussed, see also [5]. The tests of a bar in direct tension under static or impact loading as well as the fracture of concrete L-specimen based on the experiment [4] are demonstrated.

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