Mixed mode crack propagation in concrete using the Thick Level Set approach to fracture

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ABSTRACT

The Thick Level Set model is a non-local damage model introduced in [1, 2]. The damage variable is expressed in terms of a level set function, which allows to delimitate an undammaged, a partially damaged and a fully damaged zone. In particular, it gives the position of macro-cracks as an iso-value, which can be enriched to introduce a displacement discontinuity [3]. Using level set functions also makes the TLS particularly suitable to model crack branching and coalescence. Furthermore, it reduces the damage propagation problem to a problem of dimension $n-1$ (n being the dimension of the problem), which helps decreasing computing times.

Some features of the TLS approach are illustrated on the CARPIUC benchmark : the initiation of new damaged zones, the capacity to accurately recover crack paths (including crack branching and coalescence) and force displacement curves, and relatively low computing times.

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