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THREE DIMENSIONAL FRACTURE GROWTH AS A STANDARD DISSIPATIVE SYSTEM: SOME GENERAL THEOREMS AND NUMERICAL SIMULATIONS.

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The crack propagation problem for linear elastic fracture mechanics has been studied by several authors exploiting its analogy with standard dissipative systems theory (see e.g. [1, 2]). In recent publications of the Authors [3, 4, 5] minimum theorems were derived in terms of crack tip quasi static velocity for two and three-dimensional fracture mechanics. They were reminiscent of Ceradini's theorem [6] in plasticity. Following the cornerstone work of Rice [7] on weight function theory, Leblond and coworkers [8, 9] proposed asymptotic expansions for Stress Intensity Factors (SIFs) in three dimensions. As formerly in 2D, expansions can be given a Colonnetti's decomposition [9] interpretation. In view of the expression of the expansions proposed in [8, 9] however, symmetry of Ceradini's theorem operators was not evident. Following a different path of reasoning, minimum theorems have been finally derived. Moving from well established theorems in plasticity, algorithms for crack advancing have been formulated. Their performance is here presented within a set of classical benchmarks.

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