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Finite Fracture Mechanics: stress weight functions, friction, stability and symmetry

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The presentation provides miscellanea of topics, all related to FFM, currently under investigation at the Politecnico di Torino, in cooperation with other European research groups. The first topic explores the similarities between the Cohesive Crack Model and the Finite Fracture Mechanics: we show that an excellent matching between the two models can be found by introducing weight functions in the stress requirement within the Finite Fracture Mechanics approach. A correspondence rule between weight functions and cohesive laws is provided. The second topic aims at extending the Finite Fracture Mechanics approach for interfacial debonding to take friction (in its simplest form i.e. a constant residual stress) into account. We show that semi-analytical solutions can be found, e.g., for the pull-push or the pull-out tests. The third topic deals with negative geometries faced by Finite Fracture Mechanics: particularly, we consider a holed plate under biaxial loading: varying the biaxiality ratio, it is possible to span (almost) all the possible structural behaviors: completely positive, locally negative but globally positive, locally positive but globally negative geometries. Correspondingly, we investigate the stability of crack growth. The fourth and last topic is symmetric vs. asymmetric crack propagation: it is shown that, differently from LEFM, Finite Fracture Mechanics provides different failure loads depending on the kind of crack propagation. Applications are provided for the Griffith crack and the double lap joint geometries.