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HYDRAULIC FRACTURING APPROXIMATION USING FINITE ELEMENTS AND ELASTOPLASTICITY

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Hydraulic Fracturing is the process in which a fracture propagates through a pressurized fluid in its interior. It is widely used in the oil industry due the high condutivity zone that it creates, providing high rates of injection and production. The decision to undergo a well to hydraulic fracturing is typically based on studies of produtivity in order to verify if the response is economically viable. Thus, the prior simulation is a powerful tool in well engineering design.

This work consists in the numerical simulation, with finite elements, of a fracture hydraulically propagating in a two dimensional elastoplastic medium. The involved phenomena considered are the mechanical response of the reservoir, using the elastoplastic stress-strain relationship, along with Poiseuille flow within the fracture and leak-off on the walls of the fracture. Some of the concepts used in this work are NeoPZ finite element library, hp adaptivity, c + + object oriented language, cohesive zone for fracture propagation, solution transfer between meshes, automatic differentiation and coupling phenomena with use of reduced spaces. In this work a robust simulator for hydraulic fracturing with elastoplasticity is presented and comparisons between the results obtained by the linear elasticity are made.

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