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ELASTO-PLASTIC ANALYSIS OF STRUCTURES USING AN ISOGEOMETRIC FORMULATION

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Numerical simulation often involves using the Finite Element Method (FEM) where the geometry model, derived from CAD systems, usually suffer a reparameterization of the CAD geometry by piecewise low order polynomials. This information transfer between models suitable for design (CAD) and analysis (FEM) introduces significant approximation errors and entails a amount of man-hours to generate a suitable finite element mesh [1].

In order to create industrial metal parts suitable for the imposed tasks, in which meet the geometrical and mechanical requirements combined with reduced manufacturing costs, requires a continuous evolution of assistive technology in order to innovate and optimize the different stages of the production processes.

In this work it is intended to contribute to the analysis of forming processes and pipeline applications by discussing the use of an isogeometric approach into a finite element pre- developed models.

Thus, this work makes a study of how ductile materials behave when subjected to monotonic and cyclic mechanical loads. Isogeometric models with a small and large strains formulations, plasticity with isotropic hardening and plasticity with kinematic hardening are developed. Also, an introduction to a Lemaitre-based damage model is designed [2,3]. The Bauschinger effect, the mesh dependence, and the differences between the developed small and finite strain models are evaluated by comparison with the finite element typical discretization models.

The isogeometric discretization was performed taking the advantages of the symbolic and algebraic interface of the AceGen software [4].