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MECHANICAL PROPERTIES OF HYPERELASTIC MATERIALS USING DIFFERENT LOADING CONDITIONS

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To determine the mechanical properties of hyperelelastic materials requires the use of optimization schemes. For this class of materials, optimization is a mean to obtain viable estimations of the mechanical properties, given the impossibility of direct measurements of those quantities. The nonlinear mechanical behavior –measured directly- is the input, for the optimization process. The last component required is a constitutive model adequate to capture the mechanical behavior observed. The parameters of the constitutive model are the mechanical properties, which via optimization process are systematically modified to achieve a minimum (or maximum) of the objective function. For all practical purposes the objective function measures the deviation between the experimental data and the theoretical estimation. In this study an evolutionary optimization technique, differential evolution (DE) is used to estimate the mechanical properties of hyperelastic materials under different loading conditions. The successful application of DE to constitutive models such as Ogden's model and Weiss [1] modified model, in both uniaxial and biaxial loading conditions is an evidence of the versatility and adaptability of the method.

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