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Parameter Identification Strategies for non-linear mechanical models

João M.P. Martins*†, António Andrade-Campos* and Sandrine Thuillier†

* Centre for Mechanical Technology and Automation (TEMA), GRIDS Research Unit
Mechanical Engineering Department, Universidade de Aveiro
Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
e-mail: {joao.martins52, gilac}@ua.pt, web page: http://www.grids.web.ua.pt

† Univ. Bretagne Sud, FRE CNRS 3744, IRDL, F-56100 Lorient, France
Email: sandrine.thuillier@univ-ubs.fr - Web page: http://www-limatb.univ-ubs.fr/

ABSTRACT

Nowadays, the characterization of materials has received increasing attention due to the need of precise input data to computational analysis software. Simulation software uses complex material constitutive models and its success reproducing the real behaviour depends on the quality of this material models implemented and their material parameters.

In general, the parameters of nonlinear models are determined by standard tests under the assumption of homogenous strain and stress field in the zone of interest [1]. However, the homogeneous stress and strain fields generated in these relatively simple tests do not resemble the complex stress-strain fields which occur in metal forming operations. Additionally, the inverse methodology of curve-fitting between the experimental and FEM model is not reliable [2]. Nevertheless, in the last decade, Digital Image Correlation (DIC) techniques and full-field measurements have enabled the development of new parameter identification strategies such as the Full-field Finite element model updating (FEMU), the virtual fields method (VFM), the reciprocity gap method (RGM) and the dissipation gap method (DGM). Although these new strategies have proven effectiveness in linear models, their use in nonlinear models should be discussed.

Therefore, this work compares and discusses these modern methodologies and strategies for the solution of the inverse problem of determining constitutive parameters for nonlinear elastoplastic models [3]. The detailed flowcharts of each strategy are presented as well as its advantages and disadvantages. Examples are included.

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