On the Development of Dataset Supported Strategies for the Constitutive Parameters Identification of Metal Sheets

Pedro A. Prates*[1,2], André F. G. Pereira[2], José V. Fernandes[2] and Nataliya A. Sakharova[2]

[2] University of Coimbra
Centre for Mechanical Engineering, Materials and Processes (CEMMPRE)
Department of Mechanical Engineering,
Polo II – Pinhal de Marrocos, 3030-788 Coimbra, Portugal

[1] Department of Mechanical Engineering
Centre for Mechanical Technology and Automation (TEMA)
University of Aveiro
Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
Email: prates@ua.pt

ABSTRACT

Data driven approaches have become a subject of current interest for the identification of constitutive parameters of metal sheets, mainly due to the increasing availability of large datasets coupled with the exponential growth of computer performance [1, 2]. However, the use of such dataset supported approaches in the context of material parameters identification is not yet fully explored. This work explores the development of dataset supported strategies to identify the plastic behaviour of metal sheets, as an alternative to classical and inverse parameters identification strategies. First, a large dataset is built from numerical simulation results of the biaxial tensile test on a cruciform-shaped sample. A substantial set of numerical simulations were performed for hypothetical materials, where the various combinations of constitutive parameters were generated according to the Sobol sequence. For the sake of simplicity, the constitutive model adopted for all numerical simulations follows the Hill'48 yield criterion coupled with the Swift isotropic hardening law, under an associated flow rule. The dataset is populated with local and global variables of the biaxial tensile test (strain field and the evolution of the force during the test, for the two axes of the sample). In this context, the dataset consists of biaxial tensile test results obtained from each hypothetical material and the corresponding constitutive model parameters. Afterwards, the dataset is used to process the force vs. displacement results of different reference materials, using objective functions to estimate their constitutive parameters. Sensitivity analyses showed that the performance of the proposed identification strategy depends on the type of reference material, the objective function under analysis and the dataset size.

REFERENCES

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