Loading path design and material parameter identification in elastoplasticity using SVD techniques

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ABSTRACT

Although the use of simulation software in the scientific and industrial communities is widespread, methods for achieving the input data are not so well-known. However, the quality of the numerical results directly depends on the accuracy of the input data, including the constitutive model and their material parameters. Traditionally, a large number of technological mechanical tests are carried out to characterize the mechanical properties of materials (such as tensile, shear and loading-unloading tests, Baushinger tests, *etc.*) and, subsequently, the experimental results are used in the solution of the inverse problem of parameter identification. These tests and approaches are very material and time-consuming and there is no guarantee that the obtained information is enough to a precise characterization of the material. Even with the use of full-field measurements, there is not yet method for parameter identification of non-linear constitutive models that can guarantee a successful process. Much of this weakness is related to the lack of sufficient informativeness of the experimental test used.

In this work, a parameter identification methodology based on energy principles and single value decomposition (SVD) technique is proposed for non-linear isotropic elastoplasticity [1]. This methodology allows to determine the material parameters and to quantify the informativeness used in the inverse process as well. Therefore, the information provided by the mechanical test and retrieved using full-field measurements can be evaluated. The most informative loading path is calculated and analyzed allowing designing multiaxial tests for parameter identification in non-linear elastoplasticity.

REFERENCES

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