CONSTITUTIVE MODELLING

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ABSTRACT

In order to precisely simulate manufacturing processes, accurate constitutive models are required. The quality of the simulation results is directly dependent on the quality of the numerical inputs, which is those models and their parameters. Nowadays, in computational solid mechanics, a large number of behaviour laws are available in the literature. However, the challenge of having more precise constitutive models accounting for more behaviour phenomena is still open. Such an example may come from multiscale modelling, which aims to determine averaged global constitutive behaviour of heterogeneous materials by taking into account micro-structural effects, which certainly influences overall properties of the materials.

Identifying the correct constitutive parameters of materials is a key aspect in engineering, especially when numerical models are used to reproduce complex manufacturing processes or highly non-linear materials. With the latest advances and the increasing application of full-field measurements, new techniques and strategies for inverse parameter identification have been presented. Finite element model updating (FEMU), virtual fields method (VFM), reciprocity gap method (RGM) and dissipation gap method (DGM) are examples of recently developed methods for the purpose of identifying parameters of material constitutive models. The majority of these methods use optimization techniques to identify the parameters of non-linear models. Additionally, filtering techniques and sensitivity analysis are also relevant tools for particular strategies.

This topic has numerous applications in all sciences and engineering disciplines, and is of utmost importance for the CMN2017 congress. In this thematic session, all aspects related to these issues are discussed. Academic as well as industrial engineering contributions are welcomed, as well as contributions on the following subjects:

- Development of new numerical constitutive models;
- Implementation details concerning constitutive models;
- Multiscale constitutive models;
- Identification of constitutive, friction, heat transfer or damage parameters;
- Design of experimental procedures and measurement techniques for inverse analysis;
- Numerical methods and algorithms for parameter identification analysis;
- Robust analysis and techniques for modelling and parameter identification;
- Integrated approaches for constitutive modelling and parameter identification;
- Software development for material simulation and parameter identification in solids;

- Integrated analyses filling the gap between constitutive parameters and robustness of numerical predictions for industrial problems.