Multi-scale Computations for Nonlinear, Coupled and Interaction Problems by Operator Split Methods

by

Adnan Ibrahimbegovic

Ecole Normale Supérieure de Cachan, France

In this work we present some recent developments on multi-scale analysis of inelastic behavior of structures, where both macro and micro scales are handled by the finite element method computations. We show how the proposed approach can fit within the standard computer program architecture, leading to significant extensión of modelling capabilities of the existing software. In the second part of the lecture, we present further extension of the proposed method towards coupled and interaction problems. In particular, we study the thermomechanical coupling and fluid-structure interaction problems. These studies are carried out in fully nonlinear setting, providing the sufficient conditions to guarantee the stability of operator split method applied to this class of problems. We also show how the proposed approach can benefit from the existing software products, each developped for particular sub-problem, which can significantly accelerate the solution tools developments. Several numerical examples will be presented in order to further illustrate the sallient features of the proposed methodology. Further details can be found in [1,2,3,4,5,6].

References

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