Advances in Computational Mechanics

Einladung zum Vortrag

Variational formulation of coupled thermo-mechanical boundary-value problems and application to thermo-visco-plasticity

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Thermal effects play a significant role in the dynamic behavior of metals, such as in some forming processes, crash and impact, or other extreme mechanical loadings. The energy dissipated by visco-plastic micro-mechanisms is transformed into heat, generating a local temperature increase which affects mechanical properties. In particular, this two-way interaction can enter into an auto-catalytic regime, leading to localization of deformation and fracture.

In this work, we adopt a variational approach to constitutive models and balance equations, based on a thermodynamic formulation (Generalized Standard Materials). The coupled thermo-mechanical boundary-value problem is then solved as an optimization problem.This variational structures presents several advantages with respect to classical formulations, such as inherent mathematical symmetry, or the possibility to exploit different optimization strategies, corresponding to various monolithic or staggered algorithms.

We will show in some details how this formulation applies to thermo-visco-plasticity, make some parallels with classical formulations in small and finite strains, and discuss through illustrative examples the relative performances of various solution strategies derived in this variational framework.

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MW 1250 **Maschinenwesen, Boltzmannstr. 15, 85748 Garching**

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