MULTIPLIER ANALYSIS
FOR THE PRANDTL REUSS LAW

Jens Frehse
University of Bonn, Germany
e-mail: `mathfrehse@googlemail.com`

Joint work with Jan Malý

Abstract

We consider the elastic-plastic deformation modelled by the Prandtl-Reuss law with von Mises yield condition. The usual penalty approximation of this problem leads to stresses in L^2, with additional regularity in the Sobolev space H^1. The velocities of the elastic and plastic strain velocities are only elements of the space C^* since only L^1-estimates for the corresponding approximations in the penalty approximation are available. From the engineering model, the plastic strain velocity has the form

$$\lambda \left(\sigma - \tfrac{1}{3} \operatorname{tr} \sigma I \right) / \kappa \, ,$$

where κ is the yield constant. In two dimensions, we deduce this identity from the penalty approximation. It turns out, that the multiplier lambda is an element of the space C^* and, in addition, an element of $(H^1)^*$. So, the action of λ to the deviatoric part of the stress is defined. The multiplier λ is obtained as the limit of corresponding terms from the penalty approximation.