Nečas Center for Mathematical Modeling

MOdelling REvisited + MOdel REduction
ERC-CZ project LL1202 - MORE

MINISTRY OF EDUCATION, YOUTH AND SPORTS

Implicitly constituted materials: mixed formulations, numerical solutions and computations

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Mathematical Institute

Implicitly constituted models

- Modeling: generalization of classical models, includes some new models.
- Analysis: well suitable for analysis of existence of a solution.
- How about computations/numerics?

Governing equations

- balance equations

$$\varrho \frac{\partial \mathbf{v}}{\partial t} + \varrho [\nabla \mathbf{v}] \mathbf{v} = \operatorname{div} \mathbf{T} + \varrho \mathbf{f}$$

$$\operatorname{div} \mathbf{v} = 0$$

- constitutive equations

$$\mathbf{G}(\mathbf{T}, \mathbf{D}) = 0$$

- boundary conditions

$$\mathbf{v} = \mathbf{v}_B$$

$$\mathbf{T}\mathbf{n} = \mathbf{g}$$

$$\mathbf{v} \cdot \mathbf{n} = 0, \quad \alpha \mathbf{v} \cdot \mathbf{t} = \mathbf{T}\mathbf{n} \cdot \mathbf{t}$$

Further development goals - challenging problems

- ☞ complete understanding of advantages and drawbacks - from model equations, trough analysis and numerical solution
- ☞ Can we compensate for the larger systems by more efficient solution methods?
  - efficient linear solver, preconditioners for block systems, as combination with iterative GMRES/BiCGStab/multigrid and direct methods...
  - stopping criteria for nonlinear/linear solvers...