



Institute of Mathematics
Czech Academy of Sciences



Dvě aplikace matematiky v praxi

Interdisciplinární seminář

Středa 14. září 2016

Matematický ústav AV ČR

Praha 1, Žitná 25, Modrá posluchárna

Podpořeno Akademií věd České republiky v rámci Strategie AV21

9:00 Ing. Jaroslav Beneš, Ing. Michal Schmid, Doosan Bobcat Engineering s.r.o., Dobříš, Czech Republic

Numerical Simulations in Earth-Moving Machinery

Abstract. The presentation describes CFD (Computational Fluid Dynamics) simulations used in Doosan Bobcat Engineering s.r.o. Nowadays numerical models play important role in new product development. The simulations philosophy, numerical settings, results and limitations are discussed for each analysis. Topics are underhood, tank filling, hydraulic pump, engine air suction and cushioning. Part of the topics are case studies, which need to be developed to provide efficient virtual prototyping. The underhood analysis is engine cooling phenomena, hence it contains fan model, heat exchangers and the whole engine bay assembly. The hydraulic pump case consists of separate internal flow analyses with multiphase flow, transient phenomena and geometry motions. The Engine air suction analysis describes internal flow inside the pipes and filter with focus on pressure drop and noise attenuation. The cushioning is hydraulic piston analysis and the issue is the inertial motion of the piston until it stops. The presentation is followed by a brief mention about the future visions: acoustics, thermodynamics and numerical model of soil.

10:00–10:30 Coffee break

10:30 Prof. Dr. Dorothee Knees, University of Kassel, Germany

Convergence of alternate minimization schemes for phase field fracture and damage

Abstract. It is well known that rate-independent systems involving nonconvex stored energy functionals in general do not allow for time-continuous solutions even if the given data are smooth in time. Several solution concepts are proposed to deal with these discontinuities, among them the meanwhile classical global energetic approach and the more recent vanishing viscosity approach. Both approaches generate solutions with a well characterized jump behavior. However, the solution concepts are not equivalent. In this context, numerical discretization schemes are needed that efficiently and reliably approximate directly that type of solution that one is interested in. If the underlying energy functional is separately convex, which is the case for many damage models, a popular way to construct time-discrete solutions is to apply alternate minimization algorithms. The aim of this lecture is to study the convergence of this ansatz and to characterize as detailed as possible the limit curves as the discretization parameters tend to zero.

Switching to a time-reparametrized picture, the behavior at jump points can be made visible and similarities and differences to the above mentioned other approaches will be discussed. This is joint work with M. Negri, Pavia. *D. Knees and M. Negri, Convergence of alternate minimization schemes for phase field fracture and damage, CVGMT-Preprint, (2015).*