



**Czech Society for Mechanics  
and Institute of Thermomechanics, CAS**

invite you to a lecture and discussion within the lecture series **Institute of Thermomechanics Seminar**

## **Recent advances in reciprocal mass matrices**

given by

**Dr. Anton Tkachuk**

Institute for Structural Mechanics,  
University of Stuttgart, Stuttgart, Germany

in collaboration with Anne Schäuble, Prof. Manfred Bischoff

Standard explicit dynamic simulation relies on diagonal or lumped mass matrices. Lumped mass enables a trivial computation of the nodal accelerations from the total force vector. Moreover, critical time step estimators and contact-impact algorithms for such mass types are well understood and developed. A disadvantage of the explicit time integration with the lumped mass is huge number of the time steps even for short time dynamics. Recently, several approaches for reciprocal mass matrix that allows higher time steps and reduction of the total computational cost were proposed. A reciprocal mass is a sparse inverse of mass matrix that usually has a mask/structure of consistent mass or stiffness matrix. It can be constructed directly and cheaply either with variational or with algebraic methods. Achievable speed-up with respect to lumped mass is from 20% to 50%.

In this talk, an overview of existing approaches of construction reciprocal mass matrices is given and recent advances in reciprocal mass matrices for impact algorithms, time step estimation and assessment of the error in heterogeneous materials are presented.

**The lecture will be held on Tuesday, August 17, 2017 at 11:00 in the building  
of the Institute of Thermodynamics (lecture room B), Dolejškova 5, 182 00 Prague 8**