



Lecture No. 65

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

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

A parallel multilevel domain decomposition solver and its application to adaptive finite element method

given by

Dr. Jakub Šístek

Institute of Mathematics of the Czech Academy of Science

In the first part of the talk, a brief overview of the development of nonoverlapping domain decomposition methods will be given. The focus will be on the iterative substructuring methods using primal unknowns. The Balancing Domain Decomposition based on Constraints (BDDC) by C. Dohrmann will be used for describing these concepts. Next, two extensions of the original BDDC method will be discussed. The first is an adaptive generation of the coarse space to enhance its robustness, e.g. for finite element problems with variable coefficients. The second is an extension of the method to multiple levels, an approach to improving scalability of the method for parallel computations. Our open-source implementation of this Adaptive Multilevel BDDC method, the BDDCML library, will be presented.

In the second part of the talk, we will discuss combination of this solver with the finite element method using an adaptive mesh refinement (AMR). AMR is challenging in the context of distributed memory parallel FEM in general. The treatment of hanging nodes will be also described. Of particular interest is the effect of disconnected subdomains, a typical output of the employed mesh partitioning based on space-filling curves.

The talk will be concluded with numerical results for benchmark Poisson and linear elasticity problems.

**The lecture will be held on Wednesday, April 3, 2019 at 10:00 in the building
of the Institute of Thermomechanics (lecture room B), Dolejšková 5, 182 00 Prague 8**