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IWR Colloquium Winter Term 2017 / 2018

January 10, 2018 / 16:15
Mathematikon, Conference Room / 5th Floor
Im Neuenheimer Feld 205, 69120 Heidelberg

Speaker:
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Title:
“Stabilised Finite Element Methods for Variational Inequalities"

Abstract:
We survey our recent and ongoing work [1,2] on finite element methods for contact problems. Our approach is to first write the problem in mixed form, in which the contact pressure act as a Lagrange multiplier. In order to avoid the problems related to a direct mixed finite element discretisation, we use a stabilised formulation, in which appropriately weighted residual terms are added to the discrete variational forms. We prove that the formulation is uniformly stable, which implies an optimal a priori error estimate. Using the stability of the continuous problem, we also prove a posteriori estimates, the optimality of which is ensured by local lower bounds. In the implementation of the methods, the discrete Lagrange multiplier is locally eliminated, leading to a Nitsche-type method [3].

Joint work with Tom Gustafsson (Aalto) and Juha Videman (Lisbon).

For the problems of a membrane and plate subject to solid obstacles, we present numerical results.

References:

[1] T. Gustafsson, R. Stenberg, J. Videman. Mixed and stabilized finite element methods for the obstacle problem. SIAM Journal of Numerical Analysis 55 (2017) 2718–2744

[2] T. Gustafsson, R. Stenberg, J. Videman. Stabilized methods for the plate obstacle problem. https://arxiv.org/abs/1707.08396

[3] E. Burman, P. Hansbo, M.G. Larson, R. Stenberg. Galerkin least squares finite element method for the obstacle problem. Computer Methods in Applied Mechanics and Engineering 313 (2017) 362–374

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Website IWR-Colloquium: www.iwr.uni-heidelberg.de/iwr-colloquium