Nonsmooth Decomposition Methods for Frictional Contact Problems in Elasticity

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In this talk, we give a framework for the construction of non-linear and non-smooth decomposition methods for the efficient and robust solution of frictional contact problems in space and time. Taking the locality of the friction law and the non-penetration constraints into account, multiscale methods offer the possibility to use different models on different scales concurrently for the modeling as well as the simulation process. These can be used to "separate" interface processes and the processes within the material. From the point of view of the arising discrete large scale problems, however, domain decomposition seem to be a natural approach for the construction of non-linear solution methods. We present an adaptive non-linear parallel solution method for frictional contact problems, which uses ideas from multiscale as well as domain decomposition methods. Our general approach allows also for the treatment of coupled problems as occur in thermoelasticity.

In case of complicated gepometries and materials as occur, moreover topics as the information transfer between non-matching meshes at curvilinear boundaries as well the treatment of non-linear material laws have to be considered. We discuss some new ideas for mortar-based transfer operators at the contact interface and consider also shortly the case of non-linear material laws and large deformations.

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