Partitioned solution of surface coupled problems

The simulation of surface coupled problems is a field of interest in many engineering disciplines. In general, surface coupled problems can be described as two fields with typically, but not obligatory, differing physics, which interact at a common boundary.

Two important subjects within the simulation of these problems are the influence of temporal and spatial coupling methodologies. Coupling in time is straightforward in the case of identical time steps in both fields. But the different demands of the single fields typically lead to differing sizes of the time steps for an efficient solution of the subproblem. A similar problem arises in the case of spatial coupling methodologies. If the surface discretization of the two fields at the common interface is equal, information transfer from one to the other side is trivial. But typically, there exist non-matching surface meshes resulting from e.g. different discretization schemes or domain definitions.

Within this project, solution approaches for the the above mentioned problems should be examined by a detailed literature review. Promising approaches should be implemented and validated into the existing software environment, which is based on a three field approach. The students working on this project should have basic knowledge and interest within the following fields: Object-oriented programming in C++, massively parallel computing within an MPMD-software environment using MPI on a Linux-based cluster system, algorithmic treatment within surface coupled partitioned analysis, energy conservation in transient multifield simulations.

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