Algorithms for Multi-Model Coupled Problems in preCICE

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ABSTRACT

By multi-model coupling, we refer to the surface coupling of a high-fidelity model to a low-fidelity model in a single simulation resulting in a spatial model adaptivity. Using the high-fidelity model for the complete simulation is computationally too expensive, while the low-fidelity model is not accurate enough. The fundamental challenge in multi-model coupling is, that the models are in many cases disparate, e.g. they may have different dimensionalities or different numbers of state variables. Furthermore, for many cases, we need to reconcile effects on different temporal and spatial scales.

The library preCICE[1] allows the simple black-box coupling of existing legacy codes to multi-physics simulations, including ready-to-use adapters for community codes, such as OpenFOAM, SU2, or CalculiX, and an high-level API for easy integration into in-house codes.

This contribution presents work in progress on preparing preCICE for model-model coupling. We extend the library by algorithms for coupling different geometric dimensions (1D-3D, 2D-3D) and higher-order interpolation in time.

REFERENCES

[1] H-J. Bungartz, F. Lindner, B. Gatzhammer, M. Mehl, K. Scheufele, A. Shukaev and B. Uekermann, preCICE – A Fully Parallel Library for Multi-Physics Surface Coupling. *Computers and Fluids*, Vol. **141**, pp. 250–258, 2016.