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ParaPhase - space-time parallel adaptive simulation of phase-field models on HPC architectures

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Summary

Phase-field models are an important class of mathematical techniques for the description of industry-relevant physical and technical processes like modelling of cracks or the representation of liquid phase epitaxy. The price for the broad applicability and mathematical elegance of this approach is the significant computing cost required for the simulation of phase-field equations at large scales. The enormous number of degrees-of-freedom in space and time as well as the significant complexity of the simulation demand the use of modern HPC architectures. In this talk we introduce the ParaPhase project and its three key approaches to tackle these challenges: heterogeneous parallelization in space using an adaptive phase-field multigrid algorithm, innovative parallelization in time and flexible high-order methods in space and time. We describe the numerical methods, their applications and show first results with the DUNE framework.

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