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PHASE-FIELD DRIVEN GOAL-ORIENTED MODEL ADAPTIVITY FOR BLENDING SCHEMES TOWARD OPTIMIZED MULTISCALE MODELING

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Adaptive strategies combined with error estimation techniques allow the development of efficient and accurate algorithms to solve complex problems. As opposed to mesh refinement, model adaptivity is focused on refining the mathematical models to control and determine the accuracy of surrogate models with respect to their reference models. We developed a novel method for model adaptivity, applicable to blending schemes in concurrent multiscale modeling, based on combined phase-field models and goal-oriented error estimation. In contrast to more traditional approaches, where model adaptivity is driven by the geometry of the domain, the proposed method uses a diffuse interface approach to optimize the shape of blending functions to control errors with respect to a goal quantity. This method can handle highly complex geometries, avoids the introduction of a priori analytical functional forms for blending functions, and drives the model adaptivity without the need of tracking model interfaces. This work represents an entirely new application of phase-field methods, where the phase field does not represent a physical quantity. This talk will provide an overview of blending schemes in concurrent multiscale modeling and present a phase-field driven goal-oriented model adaptivity method.