Goal-orient, adaptive space-time discretizations for multi-scale phenomenon

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For phenomenon that exhibit a wide range of scales, adaptive methods can enable efficient yet accurate discretizations. In this talk, we consider the use of space-time adaptive methods to solve time-dependent, multi-scale phenomenon in which the space-time domain is discretized using simplices (i.e. pentatopes for 3D+time) that are not required to have face aligned with the temporal direction. The adaptive method utilizes an goal-oriented approach in which an adjoint solution and dual-weighted residual is employed to estimate the local contribution to the discretization error of a desired output. The dependence of the error estimate on the mesh is then synthesized into a model using the Metric Optimization through Error Sampling and Synthesis (MOESS) algorithm, and the resulting error model is then optimized to produce adapted meshes with minimal error at a fixed computational cost. We demonstrate this approach for higher-order finite element discretizations applied to convection-dominated flows and porous media. Also, similar to parallel-in-time strategies, we show that parallel solution of space-time adapted meshes are more scalable than time-marching approaches. We conclude with a discussion of remaining challenges and opportunities for space-time adaptive methods.

***Thursday, 5 December 2019, 3:00pm**
***Please note special time**
Refreshments 2:45 pm
NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1022 Large Auditorium

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