

On performance and portability for the libCEED finite element library

Jeremy Thompson, Jed Brown

One of the challenges with high-order finite element and spectral element methods is that a global sparse matrix is no longer a good representation of a high-order linear operator, both with respect to the FLOPs needed for evaluation and the memory transfer needed for a matrix-vector multiply. Thus, high-order methods require a new operator description that still represents a linear (or more generally non-linear) operator. libCEED is an extensible library that provides a portable algebraic interface and optimized implementations suitable for high-order operators. libCEED's operator description is easy to incorporate in a wide variety of applications, without significant refactoring of the discretization infrastructure. We introduce the libCEED API and show performance results for a Navier-Stokes solver using libCEED and PETSc.