A BROKEN FEEC FRAMEWORK FOR ELECTROMAGNETIC PROBLEMS ON MAPPED MULTIPATCH DOMAINS

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In this talk I will present a broken-FEEC framework on mapped multipatch domains and illustrate it with structure-preserving approximations of various problems arising in electromagnetics, using the Psydac Python library [9].

This discretization paradigm extends the finite element exterior calculus (FEEC) method [3, 8, 1, 2], to discrete de Rham sequences which are broken, i.e., fully discontinuous across the patch interfaces. It also extends previous works on Conforming/Nonconforming Galerkin (CONGA) schemes developped for the Maxwell's equation [5, 6] to the broken discretization of full de Rham complexes with non-trivial Hodge cohomology. A key property of this approach is that all derivative (primal) and coderivative (dual) operators are local, as well as the commuting projection operators for both the primal and dual de Rham sequences.

After presenting some theoretical properties of the resulting discrete operators we will show how this applies it to several initial- and boundary-value problems, as well as eigenvalue problems arising in electromagnetics. In each case our formulations are shown to be well posed thanks to an appropriate stabilization of the jumps across the interfaces, and the solutions are extremely robust with respect to the stabilization parameter.

This work is joint with Yaman Güçlü, Said Hadjout and Eric Sonnendrücker.

References

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