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Sparsity optimized high order finite element functions for H(div) on simplices
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Keywords: finite element methods; sparsity; high order finite element functions; simplices

Review text:
The authors investigate the space of vector valued–functions with square–integrable divergence and conforming h_p finite element discretization for open bounded Lipschitz domains $\Omega \subset R^d$ with $d = 2, 3$. A new set of of basis functions for H(div)-conforming h_p finite element spaces, which yields an optimal sparsity pattern for system matrices derived from the discretization of some convenient bilinear form, is introduced. The construction of basis functions relies on some known construction principles in the literature which concerns the sparsity of H(div)-conforming discretizations. More precise, the construction principles are related to the use of Raviart–Thomas elements, mixed–weighted Jacobi polynomials, and Dubiner basis. This construction implies the L_2 orthogonality of the fluxes of the basis.
The proof of sparsity of the mass matrix requires some symbolic computation. The stated finite element basis form a hierarchical set of H(div)-conforming basis functions and hence are applicable also in general settings on unstructured (curved) simplicial meshes.

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