Properties of sparse shape functions for p-FEM on triangles and tetrahedra

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In this talk, the second order boundary value problem $-\nabla \cdot (\mathcal{A}(x,y)\nabla u) = f$ is discretized by the Finite Element Method using piecewise polynomial functions of degree p on a triangular/tetrahedral mesh.

On the reference element, we define several interior ansatz functions based on integrated Jacobi polynomials. If $\mathcal{A}$ is a constant function on each element and each triangle has straight edges, the element stiffness matrix has not more than $\mathcal{O}(p^d)$, $d = 2, 3$ nonzero matrix entries.

We investigate the growth of the condition number of the element stiffness matrix with respect to the weight of the integrated Jacobi polynomials.

This is a joint work with V. Pillwein (SFB F013, Linz) and J. Schöberl.

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