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Anisotropic estimates for H(**curl**)- and H(**div**)- conforming elements on prisms and applications.*

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Abstract

The solution of the Poisson problem with Dirichlet boundary conditions on non convex polyhedral domains may show singularities on edges or vertices which degrade the convergence of the FEMs [2]. One way to recover the optimal order consists of using graded meshes, which are inevitably anisotropic. Similar behaviors exhibit the solutions of other problems as, for instance, Stokes systems and Maxwell time harmonic equations [7]. We consider the edge elements of Nédélec and the Raviart-Thomas elements [5, 6] in arbitrarily anisotropic prisms, and their corresponding k-th order interpolation operators and prove anisotropic and uniform local interpolation error estimates for each one of them. This is a generalization of what is known for tetra and hexahedra [3, 4] and, in practice, it allows to reduce the number of degrees of freedom as well as to avoid the use of a kind of narrow tetrahedra for which anisotropic error estimates are not valid. As an application, for the mixed formulation of the Poisson problem with data in L^2 on a polyhedron with concave edges, using the well known family of graded meshes [1], we prove optimal approximation error estimates. We use the fact that the regularity of the solution to the problem treated here can be characterized in terms of weighted Sobolev norms.

Key words: anisotropic finite elements, mixed finite elements, Raviart-Thomas interpolation, edge elements

Mathematics subject classifications (1991):

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