Kolloquium Angewandte Mathematik
Prof. Thomas Apel (BauV1)
Prof. Matthias Gerdts (LRT1)
Prof. Joachim Gwinner (LRT1)
Prof. Markus Klein (LRT1)

Vortragsankündigung

Am **Montag, dem 30.09.2013,** hält **um 17.00 Uhr**

Herr **Prof. Dr. Ariel Lombardi** (UBA & UNGS Buenos Aires)

einen Vortrag über das Thema

Results for Nédélec edge elements on anisotropic tetrahedral meshes

Der Vortrag findet im **Raum 1116** in **Gebäude 150** statt.

Abstract

The first family of Nédélec's edge elements, introduced in [3], is a conforming family of finite elements in $H(\mathrm{curl})$. It is broadly used in the approximation of elliptic partial differential equations in mixed form, such as Maxwell equation and their associated eigenproblems. Anisotropic meshes appear naturally in applications when the solution presents boundary layers or edge singularities. This is the case when considering the time-harmonic Maxwell equations in a Lipschitz polyhedron with nonconvex edges or corners. The possibility of using anisotropic elements can make the design of such meshes easier, reduce the number of elements and take advantage of the best regularity properties of the solution. In fact, in many problems, the solutions have more regularity in the direction of the edges than transversally to them.

In this talk firstly we show that uniform interpolation error estimates for edge elements can be obtained on tetrahedral meshes under the maximum angle condition. This condition allows for arbitrarily anisotropic elements needed for the discretisation of elliptic problems in general polyhedra.

Secondly, for the tetrahedral meshes used on general polyhedra, we discuss a proof of the the discrete compactness property (DCP) for edge elements of any order. The DCP was introduced by Kikuchi [1] for edge elements of lowest order on shape-regular meshes. It is a useful tool for the analysis of the approximation of Maxwell's equations, both for the source problem as well as for computing the eigenvalues (or resonant frequencies) on a bounded cavity. The numerical approximation of both problems, and so, the validity of the DCP, has been considered in different situations by several authors: Boffi, Buffa, Caorsi, Costabel, Dauge, Fernandez, Hiptmair, Monk, Nicaise, Raffetto and others.

In particular, the aspects mentioned before extend some results of Nicaise [4] and Buffa, Costabel and Dauge [2]. Precisely, we consider edge elements of any order, and we allow edge and corner refinements: our meshes are proposed in order to be able to adequately approximate the homogeneous Dirichlet problem for the Laplace operator with a right hand side in L^p for some $p \geq 2$.

Literatur

[1] F. Kikuchi, On a discrete compactness property for the Nédélec finite elements. J. Fac. Sci. Univ. Tokyo Sect. IA Math. 36 (1989) 479–490.

[2] A. Buffa, M. Costabel and M. Dauge, Algebraic convergence for anisotropic edge elements in polyhedral domains. Numer. Math. 101 (2005) 29–65.

[3] J.C. Nédélec, Mixed Finite Elements in $\mathbb{R}^3$, Numer. Math. 35 (1980) 315–341.

[4] S. Nicaise, Edge elements on anisotropic meshes and approximation of the Maxwell equations. SIAM J. Numer. Anal. 39 (2001) 784–816.

Alle Interessierten sind dazu herzlich eingeladen.