

# Some Finite Element Estimates on Anisotropic Meshes

Ariel L. Lombardi (UNGS - UBA - CONICET Argentina)

## Abstract

The classical finite element analysis assumes the regularity hypothesis on the elements. This hypothesis enters in the interpolation errors, in the stability estimates and in the bound of the consistency terms in non-conforming methods. Therefore the constants in these estimates depend on the relation between the outer and inner diameters of the elements. In this way narrow or anisotropic elements, which are important in many applications, are excluded.

For the Lagrange interpolation it is known, since the pioneering works by Babuska and Aziz (SIAM J. Numer. Anal. 13, 214-226, 1976), Jamet (RAIRO Anal. Numérique 10, 43-60, 1976), and many generalizations (see the book T. Apel, Anisotropic Finite Elements: Local Estimates and Applications, Teubner, Stuttgart, 1999), that the regularity assumption can be relaxed to the “maximum angle condition” in many cases. Results in this direction were obtained also for interpolations of interest in mixed finite element approximations of low order.

In this talk, after reviewing the known results for Lagrange interpolation on anisotropic meshes, we discuss the difficulties related to the 3 space-dimension case, and we present some recent optimal estimates for average interpolations, and for Raviart-Thomas and Nédélec elements on meshes satisfying conditions that are weaker than the shape-regularity (for example, the maximum angle condition).