

Global and Local Approximation of Gradients with Piecewise Polynomials

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The quality of a finite element solution hinges in particular on the approximation properties of the underlying finite element space. This talk concerns these properties in the model case of the approximation of the gradient of a target function by continuous piecewise polynomials over simplicial, shape-regular meshes.

In its first part we will present the following result: the global best approximation error is equivalent to an appropriate sum in terms of the local best approximation errors on the elements, which do not overlap. This means in particular that, for gradient norms, the continuity requirement does not downgrade the local approximation potential on elements and that discontinuous piecewise polynomials do not offer additional approximation power.

In the second part of the talk we will review various results in linear and nonlinear approximation by applying the aforementioned result.

Joint work with Francesco Mora (Milan).