

Quasi-optimal meshes in three dimensions

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Abstract

The finite element solution of elliptic problems leads to large systems of equations. The time required to solve these systems grows with the number of unknowns. It is desirable then to find finite dimensional spaces S_n that possess good approximation properties, so that a good approximation $u_n \in S_n$ of the solution is obtained with the dimension of S_n small. (The dimension of the Finite Element Space S_n is the same as the dimension of the resulting system.) I will first recall for the benefit of the students the main definitions and results pertaining to the finite element method. Then I will show how to construct sequences S_n that have (quasi-)optimal approximation properties first in two and then in three dimensions. Some of these results are new and were obtained in joint works with C. Bacuta, H. Li, A. Mazzucato, and L. Zikatanov. The talk will be accessible also to non-mathematicians with an interest in numerical methods.