SEMINARIO DE ANÁLISIS NUMÉRICO Y MODELACIÓN MATEMÁTICA

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Título de la Charla:

On newest vertex bisection

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Resumen

Up to now, bisection (NVB) is the only local mesh-refinement strategy for conforming meshes in $\mathbb{R}^d$ that can be used in mathematically justified adaptive finite and boundary element codes. Starting with a given initial mesh $\mathcal{T}_0$ and based on certain refinement indicators, usual adaptive algorithms mark certain elements $\mathcal{M}_\ell \subseteq \mathcal{T}_\ell$ for refinement, use bisection to generate an improved conforming mesh $\mathcal{T}_{\ell+1}$, where at least the marked elements $\mathcal{M}_\ell$ have been bisected, and iterate. In our talk, we consider the situation that $(\mathcal{T}_\ell)_{\ell\in\mathbb{N}}$ is a sequence of conforming meshes such that, for all $\ell \in \mathbb{N}$, $\mathcal{T}_{\ell+1}$ has been obtained by NVB for some arbitrary set $\mathcal{M}_\ell \subseteq \mathcal{T}_\ell$ of marked elements. We discuss two of the interesting properties of NVB. The first one is concerned with the control of additional refinements which occur in order to avoid hanging nodes. This property is a key ingredient in contemporary proofs of quasi-optimal convergence rates of adaptive FEM or BEM. The second property is the H^1-stability of the L_2-projection Π_ℓ onto the space $\mathcal{S}^1(\mathcal{T}_\ell)$ of lowest-order Courant finite elements. This property has a wide range of applications. The two mentioned properties are known to hold under certain assumptions on the initial mesh $\mathcal{T}_0$ as, e.g., growth conditions on the mesh size or special arrangement of data structures. We discuss these assumptions and show that most of them are not necessary.