An analysis of the scaled boundary Finite Element Method

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The scaled boundary finite element method (SBFEM) is a relatively novel approach to the approximation of the solution of a PDE introduced in the engineering community. Given a star-shaped domain, the scaled boundary transformation is performed such that the domain can be represented in terms of a radial coordinate and circumferential coordinates. By discretising along the circumferential coordinates only, the PDE can be rewritten as an ODE for which an analytical solution can be found under certain conditions.

In this presentation, a theoretical framework for the analysis of SBFEM is proposed. In particular, the Poisson equation is considered on a "Pacman" domain and an adequate subspace of $H^1(\Omega)$ is defined in which to seek solutions constructed with SBFEM. The well-posedness of SBFEM, a priori error estimates and several numerical examples are discussed.

References:

[1] Song, C. and Wolf, J. P. (1999), The scaled boundary finite element method—alias consistent infinitesimal finite element cell method—for diffusion. Int. J. Numer. Meth. Engng., 45: 1403-1431.

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