SEMINARIO DEL DEPARTAMENTO DE MATEMÁTICA Y FÍSICA APLICADAS

FACULTAD DE INGENIERÍA

Finite element approximation of the spectrum of the curl operator in a multiply-connected domain.

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Abstract:

In this work we are concerned with two topics: the formulation and analysis of the eigenvalue problem for the curl operator in a multiply-connected domain, and its numerical approximation by means of finite elements. We prove that the curl operator is self-adjoint on suitable Hilbert spaces, all of them being contained in the space for which curl $v \cdot n = 0$ on the boundary. Additional conditions must be imposed when the physical domain is not topologically trivial: we show that a viable choice is the vanishing of the line integrals of v on suitable homological cycles lying on the boundary. A saddle-point variational formulation is devised and analyzed, and a finite element numerical scheme is proposed. It is proved that eigenvalues and eigenfunctions are efficiently approximated, and some numerical results are presented in order to test the performance of the method.

Martes 04 de Abril de 2017, 16 : 20 horas

Auditorio San Lucas (Facultad de Medicina)

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