

Discrete vector potentials for non-simply connected three-dimensional domains

Francesca Rapetti

Laboratoire de Mathématiques,
UMR 6621 CNRS & Université de Nice et Sophia-Antipolis,
Parc Valrose, 06108 Nice cedex 02, France.

Abstract. We focus on the representation of a divergence-free vector field, defined on a connected, non-simply connected domain $\Omega \subset \mathbb{R}^3$ with a connected boundary Γ , by its curl and its normal component on the boundary. The considered problem is discretized with $H(\mathbf{curl})$ - and $H(\text{div})$ -conforming finite elements. In order to ensure the uniqueness of the vector potential, we propose a spanning tree methodology to identify the independent edges. The topological features of the domain under consideration are here analyzed by means of the homology groups of first and second order.