

Two Approaches for the Potential/field Problem With High Order Whitney Forms and New Degrees of Freedom

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Abstract

Given the degrees of freedom (dofs) of a Whitney $(k+1)$ -form w , it is not difficult to compute those of the Whitney k -form u such that $du = w$, being d the exterior derivative operator [3]. The matrix describing the operator d is particularly simple if both the potential u and the field w are defined through their weights on the small simplices, a new set of possible dofs for high order Whitney forms which have been firstly introduced in [2] and later analyzed in [1]. Once the dofs are given, the identification of the form is straightforward if a cardinal basis is known, but this is not always the case in the high order framework. We thus recall how this cardinal basis with respect to the weights on the small simplices can be easily obtained starting from a set of vector functions generating the $H(\text{curl})$ or the $H(\text{div})$ Nédélec first type spaces of degree $r \geq 1$. We then present two different approaches to solve numerically this potential/field problem.

References

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