Coupled finite element and ultra-weak variational formulation for Maxwell equations

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Abstract

The Ultra-Weak Variational Formulation (UWVF) provides an efficient framework for simulating electromagnetic wave fields in challenging computational geometries. In this work, the method is applied to situations that contain different levels of geometric components. In the applications considered, these components include, for example, an antenna and the main body where it is mounted and that scatters the wave field. The antenna model often leads to geometry that contains sharp corners, that in turn can be problematic for the plane wave basis used in the UWVF. In this work, the simulation model is coupled to polynomial basis functions, that aim to improve the accuracy on those elements located near the sharp corners. In addition, to relax the element size requirement on the scattering object or interface between different materials, support for curved element types has been studied. The applicability of the simulation software developed in this project is examined using numerical examples.