Space-Time Variational Formulations for Maxwell's Equations

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We consider Maxwell's equations in a space-time setting and the corresponding variational formulations. In particular we take a look on the vectorial wave equation for the electric field E including the spatial curl operator. As with the scalar wave equation we apply integration by parts both in time and space and discuss unique solvability of the resulting Galerkin-Petrov formulation under different assumptions on the given data. Although the numerical discretization in a 4D space-time setting seems to be ambitious at a first glance, it allows for an adaptive resolution simultaneously in time and space and for a parallel implementation.

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