ADJOINT ERROR ESTIMATION FOR ADAPTIVE REFINEMENT OF HYPERBOLIC PDES

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Time-dependent hyperbolic partial differential equations can be efficiently solved using adaptive mesh refinement, with a hierarchy of finer grid patches in regions where the solution is discontinuous or rapidly varying. These patches can be adjusted every few time steps to follow propagating waves [1, 2].

For many problems the primary interest is in tracking waves that reach one target location, perhaps after multiple reflections. The solution to an adjoint equation solved backward in time from the target location can be used to identify the regions that require refinement. These adjoint methods are incorporated in the Clawpack software [3, 4] for general hyperbolic problems and have been used in the GeoClaw software to track tsunami waves in the ocean that will reach a particular community of interest [5].

References

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