An Inexact Composite Step Method in Function Space

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Abstract: We consider a composite step method for non-linear equality constrained optimization in function space, which is tailored for optimization problems with non-linear PDEs.

Composite step methods divide their iteration steps into two components. A tangential component which aims for optimality and a normal component which aims for feasibility. This offers the flexibility of an individual damping of these two components. We employ an affine covariant damping strategy, which means that our damping factors are computed from scalar products in the domain space and function values only. This avoids the use of dual norms. Further, for globalization of the tangential steps we use a cubic model of the linearization error.

The algorithm computes inexact steps in function space, where inexactness arises from the discretization of a PDE. Discretization errors are controlled by an a-posteriori error estimation and adaptive grid refinement. As an application we present a problem from medical therapy planning.

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