
Andrei Draganescu
**Multigrid preconditioning of linear systems for
semismooth Newton methods applied to optimization
problems constrained by smoothing operators**

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In this work we address the question of constructing efficient multigrid preconditioners for the linear systems arising when applying semismooth Newton methods to large-scale linear-quadratic optimization problems constrained by smoothing operators with box-constraints on the controls. It is shown that, for certain discretizations of the optimization problem, the linear systems to be solved at each semismooth Newton iteration reduce to inverting principal minors of the Hessian of the associated unconstrained problem. As in the case when box-constraints on the controls are absent, the multigrid preconditioner introduced here is shown to increase in quality as the mesh-size decreases, resulting in a number of iterations that decreases with mesh-size. However, unlike the unconstrained case, the spectral distance between the preconditioners and the Hessian is shown to be of suboptimal order in general.