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A Line search Multigrid Method for Nonconvex Optimization.

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We present a line search multigrid method for solving discretized versions of general unconstrained infinite dimensional optimization problems. Introducing a new condition to a backtracking line search procedure, the step generated from the coarser levels is guaranteed to be a descent direction. This method is globally convergent under fairly minimal requirements on the minimization method used at all grid levels. In particular, our method does not require that these minimizations, or so-called "smoothing" steps, be taken at each grid level in contrast with multigrid algorithms for PDEs, which fail to converge without such steps. Preliminary numerical experiments show that our method is promising.