Convergence analysis for multi-step one-shot methods

M. Bonazzoli[a], H. Haddar [a], T. A. Vu [a]

a. INRIA, UMA, ENSTA Paris, Institut Polytechnique de Paris, France.

Abstract

In this work we are interested in general linear inverse problems where the corresponding forward problem is solved iteratively using fixed point methods. Then one-shot methods, which iterate at the same time on the forward problem solution and on the inverse problem unknown, can be applied. We analyze two variants of the so-called multi-step one-shot methods and establish sufficient conditions on the descent step for their convergence, by studying the eigenvalues of the block matrix of the coupled iterations. Several numerical experiments are provided to illustrate the convergence of these methods in comparison with the classical usual and shifted gradient descent. In particular, we observe that very few inner iterations on the forward problem are enough to guarantee good convergence of the inversion algorithm.