

Acceleration, inexact Newton, and Nonlinear Krylov subspace methods

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This talk will give an overview on the different techniques adopted when solving systems of nonlinear equations. It will start with a brief discussion of vector acceleration methods, pointing out a subtle practical distinction between the problem of accelerating a sequence of vectors and that of solving general nonlinear equations. The various inexact Newton approaches used for solving nonlinear equations are based on different ways in which the Jacobian or its inverse are approximated when forming the next Newton iterate. In a standard Newton type approach this Jacobian can be approximated as a general sparse matrix employing, e.g., via numerical differentiation. Acceleration techniques, and Broyden-type methods rely on the approximations obtained from successive iterates and the functional values at these points to form an approximate Newton step. We will discuss a framework for these methods and conclude with nonlinear projection-type methods which are seldom considered in the literature.