

Deferred Correction Codes for the Numerical Solution of Nonlinear BVPs

Jeff R. Cash
j.cash@ic.ac.uk
Imperial College, England

Abstract

Iterated deferred correction is a very powerful approach to the efficient numerical solution of nonlinear two point boundary value problems. An early code, TWPBVP, used deferred corrections with order up to 8 and this code has proved to be very effective for solving non-stiff and mildly stiff BVps. The original ideas behind TWPBVP have been extended to allow a deferred correction scheme based on Lobatto Runge-Kutta formulae to be derived. These formulae have the stability necessary to deal with singular perturbation problems and a continuation approach allows the efficient solution of some extremely difficult problems. In addition, the capabilities of these deferred correction codes have been extended to allow the solution of problems with parameters and with boundary conditions which are non-separated and which involve integral constraints. Very recent research has shown how the rate of convergence of deferred correction schemes can be considerably speeded up and this is likely to have a significant effect on the design of future algorithms.