SUPERCONVERGENCE OF THE ITERATED HYBRID COLLOCATION METHOD FOR WEAKLY SINGULAR VOLTERRA INTEGRAL EQUATIONS

MIN HUANG AND YUESHENG XU

Dedicated to Professor K.E. Atkinson on the occasion
of his 65th birthday with friendship and esteem

ABSTRACT. A hybrid collocation method for Volterra integral equations with weakly singular kernels was introduced in [**12**]. The main purpose of this paper is to study *superconvergence* properties of the *iterated* hybrid collocation solution. It is proved that the iterated collocation solution has an improvement on order of convergence for the original collocation solution provided that suitable collocation parameters are chosen. Moreover, we apply the hybrid collocation and the associated iterated method to solving Volterra integro-differential equations with weakly singular kernels. Numerical examples are presented to confirm the superconvergence results of the iterated collocation methods.

1. Introduction. The main purpose of this paper is to study superconvergence properties of iterated solutions of Volterra integral equations of the second kind with weakly singular kernels, based on the hybrid collocation method developed in [**12**].

It is well known that the solution of the equations exhibits a singularity near the left end-point of the domain because of the weak singularity in the kernel. When we develop a numerical method for solving equations of this type we should take this into account in order to produce an approximate solution with high order convergence. The collocation