Half-sweep Newton-SOR iteration with quadrature scheme to solve nonlinear Fredholm integral equations

ABSTRACT

This paper aims to propose an efficient and fast iterative method to solve the nonlinear Fredholm integral equations of the second kind (NFIE-2). For this starting point, we discretize the general NFIE-2 using a quadrature scheme into a corresponding nonlinear quadrature approximation equation to generate a system of nonlinear equations. Then, we convert the nonlinear system into a linear form using Newton's method so the linear system can be solved using iterative methods. To speed up the convergence rate in solving the linear system, we proposed the hybridization of the Newton-Successive Overrelaxation (NSOR) method with the half-sweep (HS) complexity reduction technique to boost its convergence rate, called half-sweep NSOR (HSNSOR) method. Also, we used the standard form of Newton-Gauss– Seidel and NSOR called FSNGS and FSNSOR, respectively as control methods to test the ability of this iterative method. Based on the output of numerical experiments, we found that the application of half-sweep to the existing NSOR provides us with a method that converge faster than the FSNGS and FSNSOR.