

Refinement of SOR method for the rational finite difference solution of first-order fredholm integro-differential equations

ABSTRACT

As it is known, the linear rational finite difference (LRFD) method has the advantage of its excellent stability, and the Successive Over-Relaxation (SOR) method has the advantage of fast convergence rate due to the flexible choice of parameter. In this paper, in order to make full use of the advantages of LRFD and SOR methods, the composite trapezoidal (CT) quadrature scheme is combined with the 3-point linear rational finite difference (3LRFD) method (CT-3LRFD) to discretize the first-order linear Fredholm integro-differential equation and produce the approximation equation. Furthermore, the SOR method is extended to be the refinement of Successive Over-Relaxation (RSOR) method which then used to solve the numerical solution of the generated linear systems. At the same time, for the sake of comparison, the classical Gauss-Seidel (GS) and Successive Over-Relaxation (SOR) methods are also introduced as the control method. In the end, through several numerical examples, the three parameters of the number of iterations, the execution time and the maximum absolute error are displayed, which fully illustrate that the RSOR method is competitive with existing GS and SOR methods in solving large dense linear system generated by the CT-3LRFD formula.