A SOR solution of one-dimensional telegraph equations by using newly established Redlich-Kister finite difference schemes

ABSTRACT

Various finite difference schemes have been established to discretize boundary value problems. Therefore, this paper proposes a numerical solution based on newly established second-order Redlich-Kister Finite Difference (RKFD) discretization schemes to approximate the one-dimensional second-order linear hyperbolic telegraph equation. By doing the discretisation process, the RKFD approximation equation leads to a large-scale and sparse system of RKFD approximation equations, which can be solved iteratively using the Gauss-Seidel (GS) Successive Over-Relaxation (SOR) iterative methods. In order to validate the capability of the SOR iterative method, two model examples have been solved iteratively via the SOR iteration and then compared to the GS iterative method at five different mesh sizes. The comparison results for both iterative methods are illustrated by focusing on three measuring parameters: number of iterations, execution time, and maximum norm. As can be observed from the numerical results, the proposed method approximates the exact solution very well.