The similarity finite difference solutions for two-dimensional parabolic partial differential equations via SOR iteration

ABSTRACT

This paper purposely attempts to solve two-dimensional (2D) parabolic partial differential equations (PDEs) using iterative numerical technique. Also, we determine the capability of proposed iterative technique known as Successive Over- Relaxation (SOR) iteration compared to Gauss–Seidel (GS) iteration for solving the 2D parabolic PDEs problem. Firstly, we transform the 2D parabolic PDEs into 2D elliptic PDEs then discretize it using the similarity finite difference (SFD) scheme in order to construct a SFD approximation equation. Then, the SFD approximation equation yields a large-scale and sparse linear system. Next, the linear system is solved by using the proposed iterative numerical technique as described before. Furthermore, the formulation and implementation of SOR iteration are also included. In addition to that, three numerical experiments were carried out to verify the performance of the SORiteration. Finally, the findings showthat the SORiteration performs better than the GS iteration with less iteration number and computational time.