Half-sweep newton-gauss-seidel for implicit finite difference solution of 1d nonlinear porous medium equations

ABSTRACT

This paper proposes a new numerical technique called Half-Sweep Newton-Gauss-Seidel (HSNGS) iterative method in solvingone-dimensional nonlinear porous medium equations. The general form of porous medium equation (PME) is discretized by using implicit finite difference scheme which leads to a nonlinear finite difference approximation equation. The developed system of nonlinear equations is transformed by the application of Newton methodinto the corresponding system of linear equations. The numerical solutions are obtained by HSNGS iteration. Four illustrative examples are chosen in order to show the effectiveness of the proposed technique. The numerical results are compared with the Full-Sweep Newton-Gauss-Seidel (FSNGS) to demonstrate the applicability of the proposed iterative method. The HSNGS iterative method shows superiority in term of iteration number and computational time.