

Application and efficiency evaluation of 4-point newton explicit group to solve 2d porous medium equation

ABSTRACT

In this paper, a linearized implicit finite difference method is used to approximate the solution of a two-dimensional nonlinear porous medium equation. A large and sparse nonlinear system is iteratively solved using the Newton method and the 4-point explicit group technique. The efficiency of the applied 4-point NEG method is evaluated based on the number of iterations and elapsed time recorded from the simulation with different grid points. The accuracy of the method is measured using the error of absolute of the numerical solution against the exact solution of the proposed problems. A comparative analysis is made using the control method, the Newton-Gauss-Seidel method. The numerical finding showed that the 4-point NEG method is faster than the Newton-Gauss-Seidel method by 36.75%, and the number of iterations is successfully reduced by 45.63%. The accuracy of the 4-point NEG method to solve two-dimensional porous medium equation is better than the Newton-Gauss-Seidel method.