

9 points difference shceme(4-order bound) programm

=====

Grid size: 11x11

Grid spacing: $dx = 0.1$, $dy = 0.1$

Program execution started with 9 points difference shceme(4-order bound)

Setting boundary conditions...

Setting interior points with consistent 6th-order 9 points difference shceme ...

Matrix initialization completed.

Total equations: 121

for 9 points difference shceme(4-order bound) ,Interior points: 49

Iteration = 0, Convergence error = $5.500e+00$, L1 error = $8.371e+00$

VTK document output: 9 points difference shceme(4-order bound)_11x11_000000.vtk

Steady state reached!

Final iteration: 580, Final convergence error : $9.653e-11$

Final L1 error: $1.202e-04$

VTK document output: 9 points difference shceme(4-order bound)_11x11_000580.vtk

Grid size 11x11 computation completed

=====

=====

Grid size: 21x21

Grid spacing: $dx = 5.000e-02$, $dy = 5.000e-02$

Program execution started with 9 points difference shceme(4-order bound)

Setting boundary conditions...

Setting interior points with consistent 6th-order 9 points difference shceme ...

Matrix initialization completed.

Total equations: 441

for 9 points difference shceme(4-order bound) ,Interior points: 289

Iteration = 0, Convergence error = 5.500e+00, L1 error = 9.185e+00

VTK document output: 9 points difference shceme(4-order bound)_21x21_000000.vtk

Iteration = 1000, Convergence error = 8.736e-06, L1 error = 3.142e-04

Iteration = 2000, Convergence error = 4.658e-10, L1 error = 9.210e-06

Steady state reached!

Final iteration: 2157, Final convergence error : 9.938e-11

Final L1 error: 9.224e-06

VTK document output: 9 points difference shceme(4-order bound)_21x21_002157.vtk

Grid size 21x21 computation completed

=====

=====

Grid size: 41x41

Grid spacing: dx = 2.500e-02, dy = 2.500e-02

Program execution started with 9 points difference shceme(4-order bound)

Setting boundary conditions...

Setting interior points with consistent 6th-order 9 points difference shceme ...

Matrix initialization completed.

Total equations: 1681

for 9 points difference shceme(4-order bound) ,Interior points: 1369

Iteration = 0, Convergence error = 8.800e+00, L1 error = 9.275e+00

VTK document output: 9 points difference shceme(4-order bound)_41x41_000000.vtk

Iteration = 1000, Convergence error = 5.889e-04, L1 error = 4.590e-02

Iteration = 2000, Convergence error = 4.241e-06, L1 error = 3.299e-04

Iteration = 3000, Convergence error = 3.054e-08, L1 error = 1.970e-06

Iteration = 4000, Convergence error = 2.199e-10, L1 error = 6.200e-07

Steady state reached!

Final iteration: 4160, Final convergence error : 9.988e-11

Final L1 error: 6.293e-07

VTK document output: 9 points difference shceme(4-order bound)_41x41_004160.vtk

Grid size 41x41 computation completed

=====

=====

Grid size: 81x81

Grid spacing: dx = 1.250e-02, dy = 1.250e-02

Program execution started with 9 points difference shceme(4-order bound)

Setting boundary conditions...

Setting interior points with consistent 6th-order 9 points difference shceme ...

Matrix initialization completed.

Total equations: 6561

for 9 points difference shceme(4-order bound) ,Interior points: 5929

Iteration = 0, Convergence error = 1.320e+01, L1 error = 9.539e+00

VTK document output: 9 points difference shceme(4-order bound)_81x81_000000.vtk

Iteration = 1000, Convergence error = 2.863e-03, L1 error = 4.069e-01

Iteration = 2000, Convergence error = 1.781e-04, L1 error = 2.530e-02

Iteration = 3000, Convergence error = 1.108e-05, L1 error = 1.573e-03

Iteration = 4000, Convergence error = 6.889e-07, L1 error = 9.781e-05

Iteration = 5000, Convergence error = 4.284e-08, L1 error = 6.043e-06

VTK document output: 9 points difference shceme(4-order bound)_81x81_005000.vtk

Iteration = 6000, Convergence error = 2.664e-09, L1 error = 3.441e-07

Iteration = 7000, Convergence error = 1.657e-10, L1 error = 3.009e-08

Steady state reached!

Final iteration: 7182, Final convergence error : 9.992e-11

Final L1 error: 3.011e-08

VTK document output: 9 points difference shceme(4-order bound)_81x81_007182.vtk

Grid size 81x81 computation completed

=====

Data file output: grid_convergence_9 points difference shceme(4-order bound).dat

Gnuplot script output: plot_convergence_9 points difference shceme(4-order bound).plt

=== Improved Grid Convergence Analysis ===

Linear regression results:

Slope = 3.976 (theoretical 4.0)

Order of accuracy = 3.976

All computations completed!