ME22BTECH11051

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ME5470: Introduction to Parallel Scientific Computing

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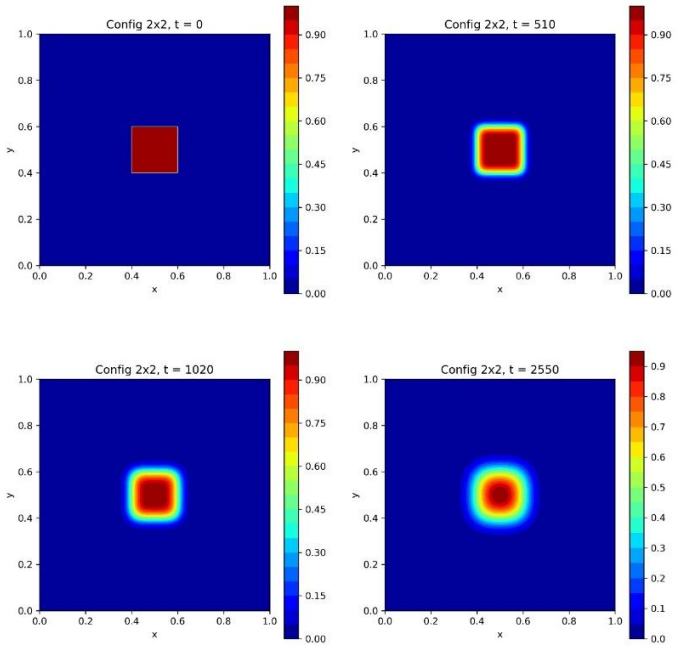
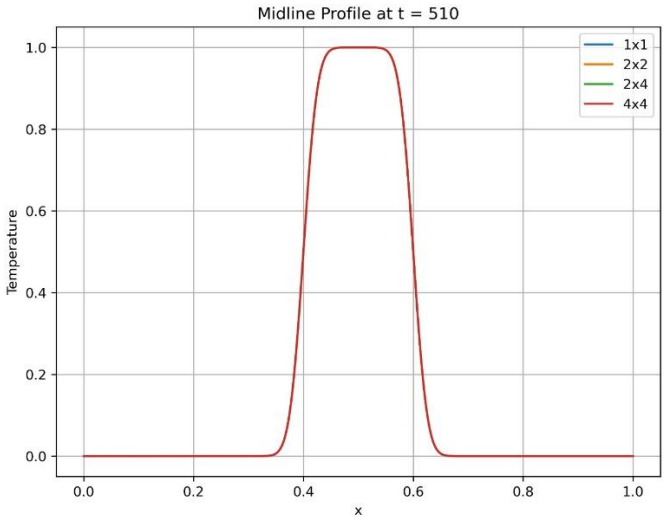
AIM: In this assignment we were supposed to write a code which implements a simplified **2D heat diffusion solver** using **MPI** for parallel processing. The goal is to compute the numerical right-hand side (RHS) of the diffusion equation and evaluate the **L2 norm of error** against an exact solution.

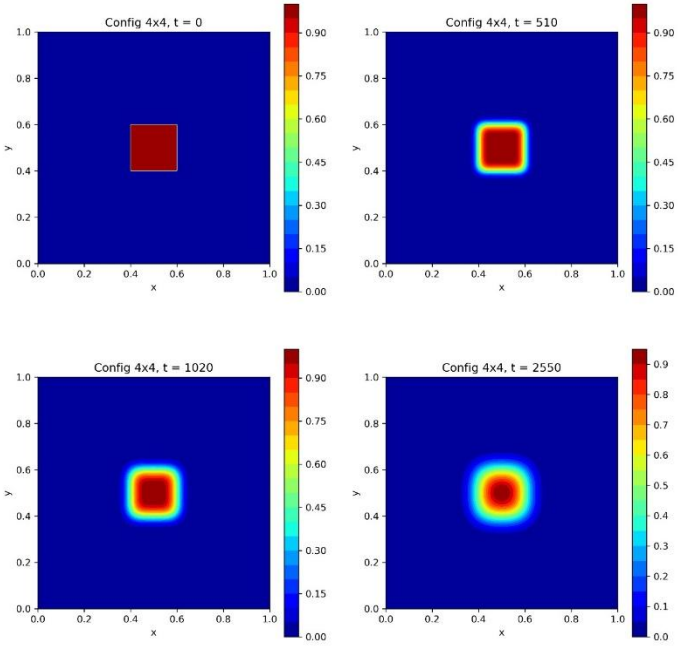
Dynamic 2D arrays (T, rhs, Texact) and 1D vectors for ghost cells are allocated:

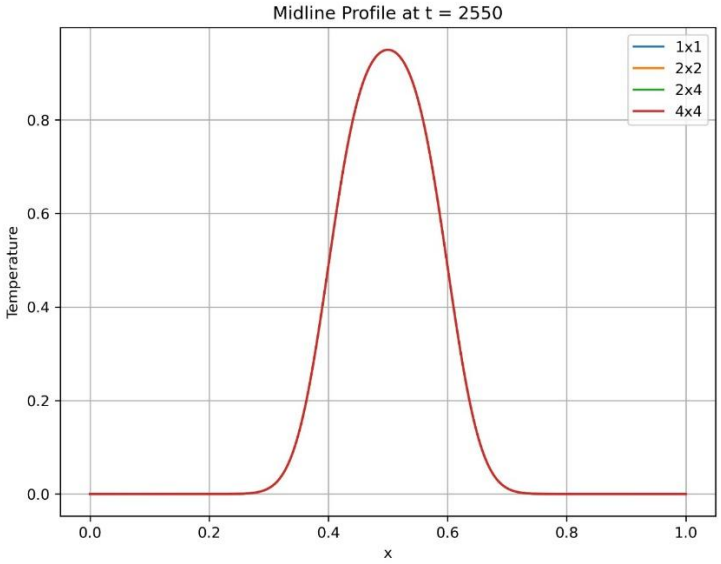
- T: Temperature field
- rhs: Computed RHS from the diffusion equation
- Texact: Analytical solution
- xleftghost, xrightghost, ybotghost, ytopghost: ghost cells for boundary communication.

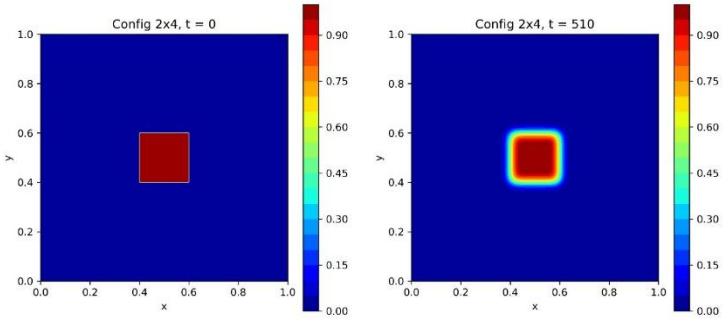
These are the plots I got after running the code.

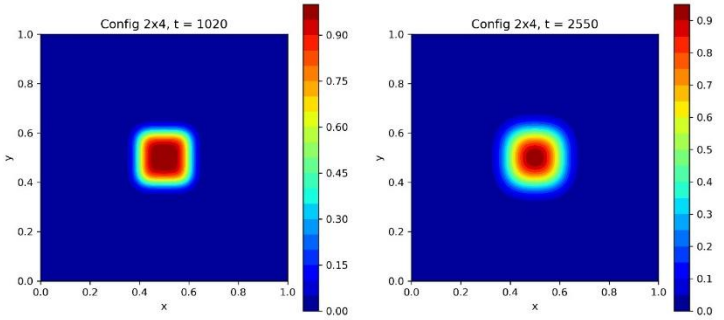


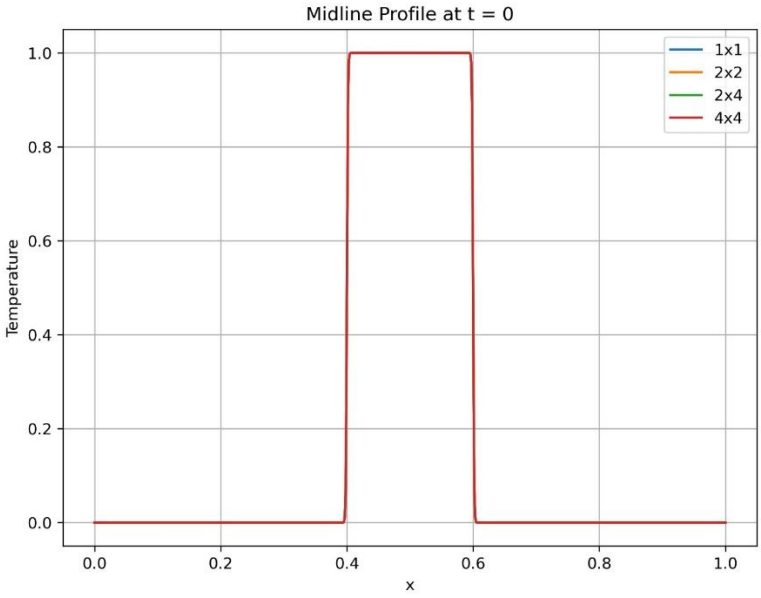

Midline Profile at t = 510
1x1
2x2
2x4
4x4
Temperature
x


Config 4x4, t = 0
Config 4x4, t = 510
Config 4x4, t = 1020
Config 4x4, t = 2550
x
y


Midline Profile at t = 2550
1x1
2x2
2x4
4x4
Temperature
x
0.0
0.2
0.4
0.6
0.8
1.0


Config 2x4, t = 0
Config 2x4, t = 510
x
y


Config 2x4, t = 1020
Config 2x4, t = 2550
x
y


Midline Profile at t = 0
1x1
2x2
2x4
4x4
Temperature
x
0.0
0.2
0.4
0.6
0.8
1.0