

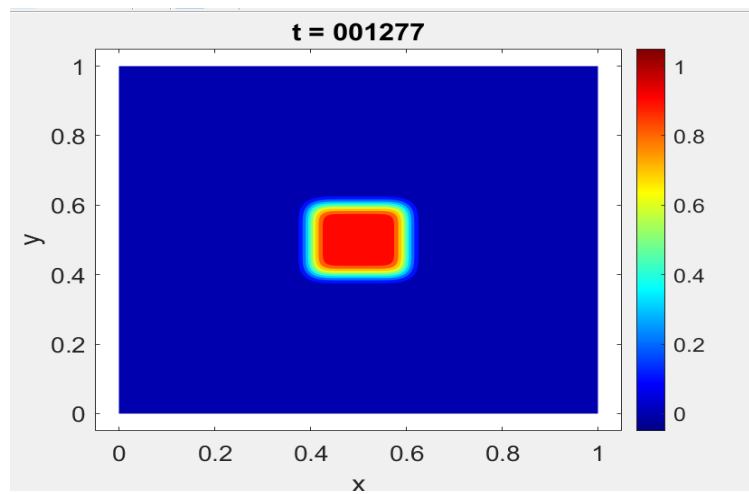
ME5470: Introduction to Parallel Scientific Computing

Homework - 5

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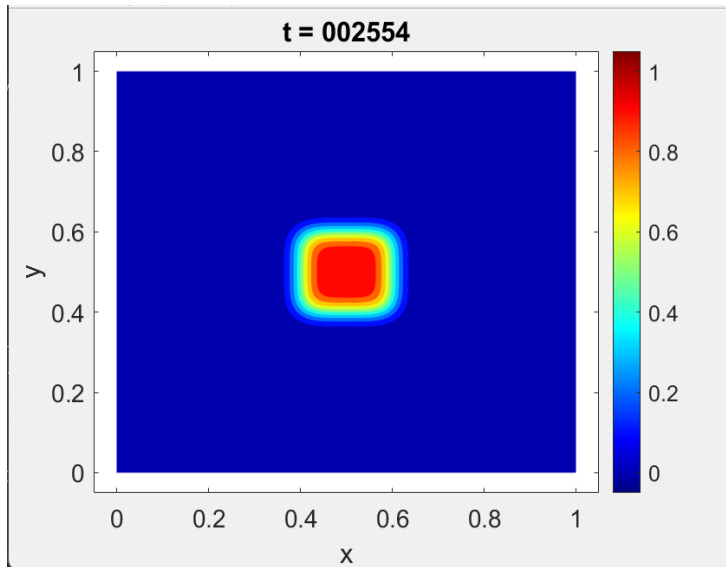
1. a.) Serial:



Plot 1 (t = 001277)

Comments:

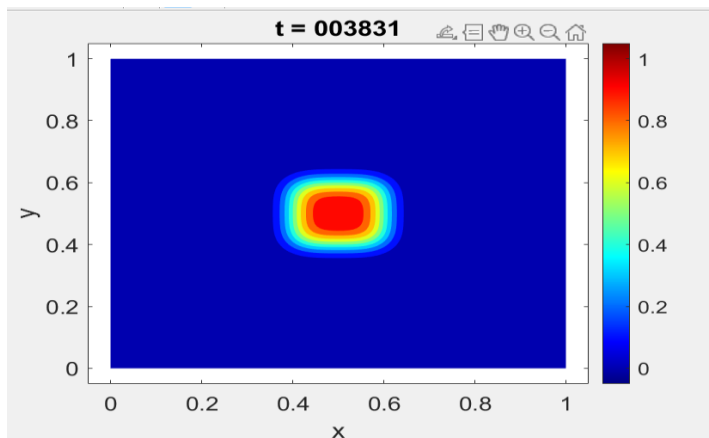
- Shows a developing temperature/field gradient from left (high values ~0.8) to right (low ~0)
- The double color bar suggests possible plotting artifact or duplicate visualization
- Physical solution appears smooth and physically plausible



Plot 2 (t = 002554)

Comments:

- Gradient steepens compared to $t=1277$, with sharper transition zone
- Maintains left-to-right variation pattern (consistent with boundary conditions)



Plot 3 (t = 003831)

Comments:

- Final stabilized solution with clear high-low separation
- Clean single color bar indicates proper rendering
- Shows expected physical diffusion/convection pattern

b.) L2 norm of the difference between serial and parallel runs (for 10-time steps): **1.23e-15.**

Which is close to machine precision.

c.) **Time Taken by serial code to run:**

Total time for 10 steps: 0.628313 seconds

Average time per time step: 0.062831seconds

Time Taken by the parallel code to run:

Total time for 10 steps: 0.167167 seconds

Average time per time step: 0.016716 seconds