

Innovative Computing Laboratory University of Tennessee, Knoxville

Before we start

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September 13, 2017



Homework

The homework submission is an automated process, including the submission itself. Upon the homework **HWX** deadline, a robot will automatically pull your **HWX** branch, test it, and partially grade it (for correctness and sometimes performance). If these tests are not successful, the grade will be directly affected.

Git

I assume your name is *bstudent*, and your fork of the homework repo is *bstudent/homework*. In case you haven't yet forked my repo <https://github.com/COSC462-UTK/homework>, do it ASAP. To facilitate your git use, you should setup you access to GitHub via ssh keys, and make sure you have a working ssh agent. This document is not a git cheat-sheet, it focuses on the minimal usage of git for the purpose of the COSC462 homework.



Clone your repo

```
1 git clone git\@github.com:bstudent\homework
2 cd homework
```

Create a branch for HW1

```
1 git checkout -b hw1
2 git branch
```

Switch to the HW1 branch (if it exists)

```
1 git branch hw1
```



Setting a remote to the homework repo

```
1 git remote add upstream \  
2   git@github.com:COOSC462-UTK/homework.git
```

Getting updates from your repo

```
1 git pull
```

Getting updates from the homework repo

```
1 git pull --rebase upstream master
```



Adding new files

```
1 git add *files*
```

Commit local changes

```
1 git commit -s
```

Making the changes visible

```
1 git push
```



- ▶ Read a good git cheat-sheet (or the manual) to learn a little bit more about git
- ▶ Don't force push your changes (push -f). It will affect the history of all the copies of your repo.
- ▶ Don't create a PR against the homework repo with your homework. Just take care of the correct branch, and everything else will be done automatically.
- ▶ Do create a PR against the homework repo if you have identified a problem with the skeleton code, and would like to provide a fix.
- ▶ Make sure all dependencies, outside the mainstream one, are in your repo, accessible to the homework branch.

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HW1 : Heat propagation using PThreads

v. 1.0.0

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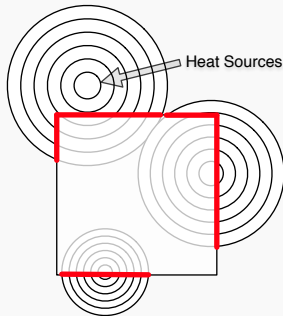


Introduction

Heat transfer



- ▶ Heat transfer is a discipline of thermal engineering that concerns the generation, use, conversion, and exchange of thermal energy (heat) between physical systems.
- ▶ Heat convection occurs when bulk flow of a fluid (gas or liquid) carries heat along with the flow of matter in the fluid.




The square is the 2D surface where the heat propagation is to be observed. The circles are the heat sources, and the heat waves they generate. The red lines are the impact of these heat sources on the boundaries of the 2D surface, and represent the stable boundary condition of the problem (they are stored in an extra column/row and are not supposed to be altered during the execution).



Improve the code provided in the directory `hw1` to make the Jacobi code (`relax_jacobi.c`) run in parallel using `pthread`s. Use the techniques presented during the lectures (matrix slicing) to transform the code into an embarrassingly parallel algorithm. Keep the current Jacobi unaltered as you will need it for verification.

What to check

- ▶ The code provided delivers the correct answer. A correct implementation of the parallel version of the Jacobi should not only remain deterministic, but provide bit-wise reproducibility of the result. Check your result against the provided code.
- ▶ The problem can be expressed in an embarrassingly parallel fashion, which should translate to an almost linear speed-up. Make sure your code delivers the expected performance, a linear speedup (depending on the number of threads, up to the maximum number of cores of the node) compared with the provided code.

A decorative graphic consisting of several overlapping, flowing, wavy lines in shades of light blue and white. The lines curve from the top left towards the bottom right, creating a sense of motion and fluidity. The background is a plain, light gray.

The deadline for HW1 is in 2 weeks,
09/22/2017!