

COSC 6374 Parallel Computation

1st homework assignment

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1st Homework

- Rules
 - Each team should deliver
 - Source code (.c file)
 - Documentation (.pdf, .doc, .tex or .txt file)
 - explanations to the code
 - answers to questions
 - Deliver electronically to gabriel@cs.uh.edu
 - Expected by Friday, October 15, 11.59pm
 - In case of questions: ask, ask, ask!



Parallel Computation
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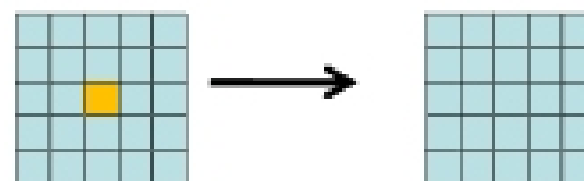


Given the sequential code for an image processing algorithm, which performs a smoothing operation on an image.

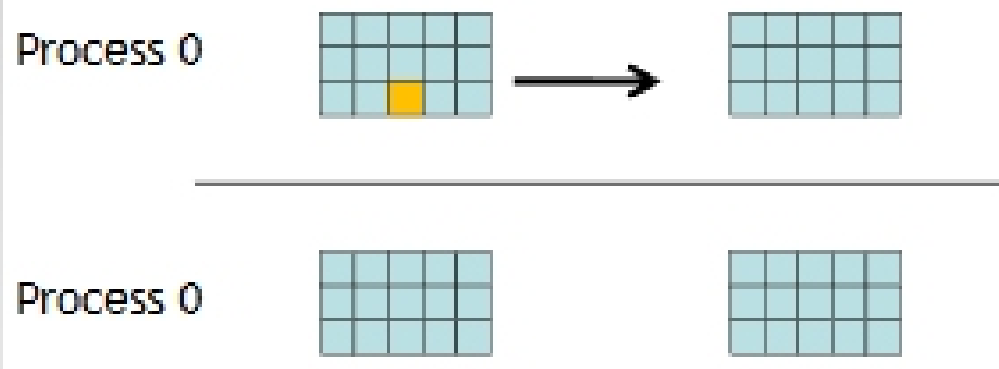
1. Parallelize the algorithm using MPI using a 1-D block-row wise data distribution
 - each process holds the same number of rows of the image
 - algorithm will require ghostcells (need to handle special case for the first and the last process)
 - need to add timing functions into the code as well
2. Measure the execution time smoothing operation for 1, 2, 4 and 8 processors for the 2048x2048 pixel image provided
3. Determine the parallel speedup and the parallel efficiency of the code sequence on the shark cluster for the 2, 4, and 8 processor cases



- Code consists of three parts:
 - reading input image (suggestion for parallelization provided later)
 - perform smoothing - grey erosion (your work)
 - write output image (suggestion for parallelization provided later)
- Algorithm:
 - change the class that a pixel has been assigned to if majority of neighboring elements have a different class
 - input file contains for each pixel the integer value of the class that it belongs to (result of segmentation + clustering)
 - for each pixels looks at an area of 5x5 pixels (2 pixels in each direction)
 - algorithm performed iteratively 10 times



- Parallelization challenge:
 - need information from neighboring processes for the



how to compile the code for measurements:

```
gcc -o smoothing smoothing.c -O3
```

how to compile the code for debugging:

```
gcc -o smoothing smoothing.c -g -O0
```

how to run the sequential code:

```
./smoothing inlabel_1024.bdf outlabel_1024.bdf  
1024 1024
```