4F03 Assignment 1

This project is also available through GitHub. The URL will be private until the submission deadline.

Authors

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Description

This C program provides two methods of image filtering to reduce noise in `ppm` formatted images. The two filter options are:

- Mean Filter
- Median Filter

Dependencies

- `openmpi`

Installation

- Install the dependencies
- Clone the repository

Operation

To run the program, first run make:

```
$ make clean
... [truncated]
$ make
mpicc -g -O2 -Wall -Wno-unused-variable   -c -o main.o main.c
mpicc -g -O2 -Wall -Wno-unused-variable   -c -o readwriteppm.o readwriteppm.c
mpicc -g -O2 -Wall -Wno-unused-variable   -c -o processimage.o processimage.c
mpicc -o ppmf main.o readwriteppm.o processimage.o
```

Then run the program as follows:

```
$ mpirun -np p ./ppmf input.ppm output.ppm N F
```

where:

• **p** is the number of processes
• **input.ppm** is the name of the input file
• **output.ppm** is the name of the output file
• **N** specifies the size of the window, that is N × N window, where N is an odd integer ≥ 3
• **F** is the type of filter. `A` for *mean filter*, and `M` for *median filter*

Work Breakdown

The work was broken down as follows:

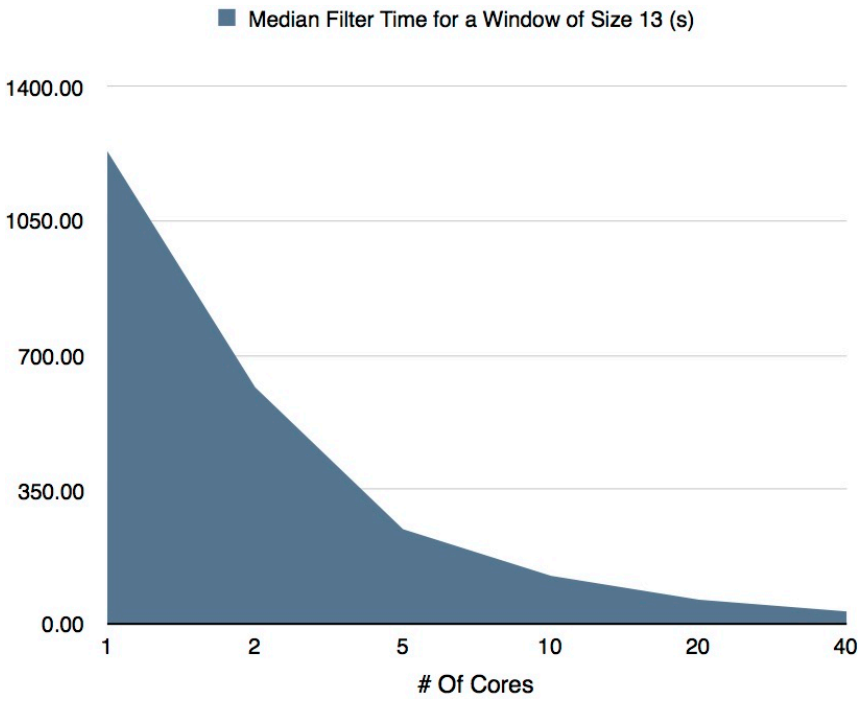
- Jamie wrote the mean filter
- Rakesh wrote the median filter
- Both authors wrote the rest of `main.c` and `processimage.c` together, in person

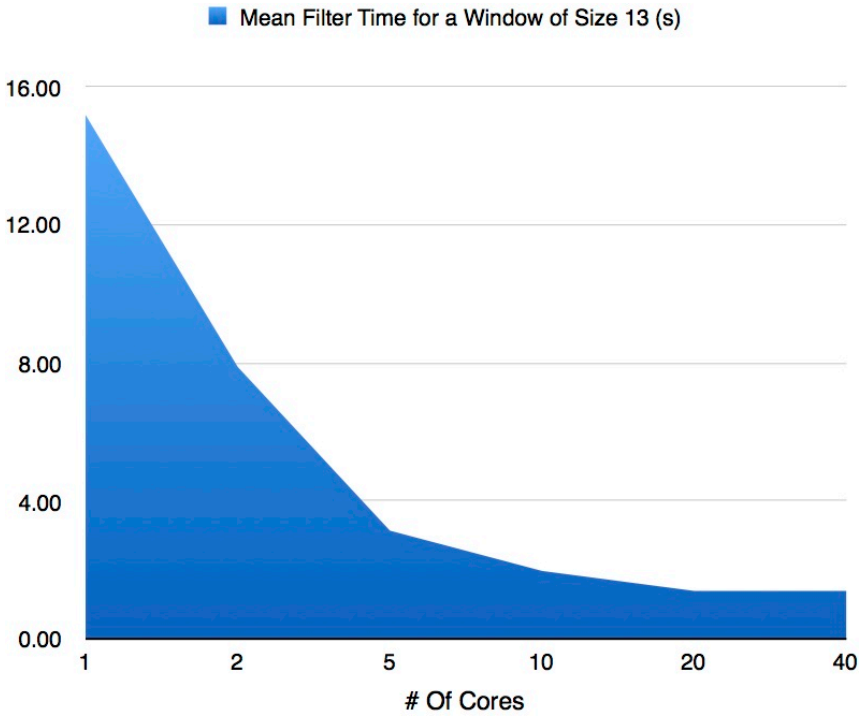
Notes

- Each process allocates and receives only the chunk of the image that it requires. Process 0 allocates and stores the entire source image, as it needs it to write back at the end of the filtering. Each other process uses only the pixels required to compute its ration of the original problem.
- This current implementation will suffer if an image loaded is larger than available memory. It is assumed that this is not the case for this assignment.

Results

The following are results from McMaster's MPIHost server.


Median Filter Time for a Window of Size 13 (s)
1400.00
1050.00
700.00
350.00
0.00
1
2
5
10
20
40
Of Cores


Mean Filter Time for a Window of Size 13 (s)
16.00
12.00
8.00
4.00
0.00
1
2
5
10
20
40
Of Cores