# ECE 565 - Fall 2018 - Homework 4

Moquan Jiang NetID: mj194

**Problem 1: Histogram**

1. **Determine which loop to be parallelized**

The first thing we need to do is figure out which loop should be parallelized, ‘for i’ and/or ‘for j’ loops. So I tested these cases:

|  |  |
| --- | --- |
| Sequencial Time | 0.07s |
| Only parallelize for i loop | 1.22s |
| Only parallelize for j loop | 0.52s |
| Nested parallelize (i & j loop) | 38.54s |

We can find that “nested parallelize” takes much more time. This is because the overhead for creating and manage the nested parallel threads are too large. Therefore ,we won’t use nested parallelization.

The advantages of paralleling outer loop is that, it can increase granularity of work in each parallel task. Less overhead to create and destroy threads. The advantages of paralleling inner loop is that, we may have better load balance.

In this case, parallelizing the inner loop have better answer. So I decided to parallelize the “for j” loop.

1. **Locks version**

I parallelized the inner “for j” loop. Private the j and shared the image (by default), and use an array of locks.

Using an array of locks, rather than one lock, benefits the speedup. And we can ensure the correctness. At each iteration, we lock the “mylocks[image->content[i][j]]”. This can ensure, for each element of histo[], only one thread can write it at any time.



1. **Atomic version**

**Problem 2: AMG**

vector

relax:

1 输出 a x sol

2Timer 计算 内层

3 输出 ii，j for u\_data

5个read

1个 write