

Operating System Homework 3 Report

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Detailed description of the implementation:

(Number of threads, the purpose of those threads, how do you use mutex lock and semaphore...etc.)

Hw3-1

- Number of threads: $5 \times 16 \times 3 = 240$ threads

5: There are 5 files in this program. I open 5 threads for each file.

```
int i[5] = {0,1,2,3,4};
pthread_t th[5];
for (int k = 0; k<5; k++){
    pthread_create( &th[k], NULL, function, i + k);
}
for (int k = 0; k<5; k++){
    pthread_join( th[k], NULL);
}
```

16: I divide each image into 16 parts. Because the image width and height could be divided by 4.

```
pthread_t th2[16];
for (int j = 0; j<4; j++){
    for (int i = 0; i<4; i++){
        pthread_create( &th2[j*4+i], NULL, Gaussian, &in[j*4+i]);
    }
}
for (int j = 0; j<4; j++){
    for (int i = 0; i<4; i++){
        pthread_join( th2[j*4+i], NULL);
    }
}
```

3: There are three main parts in this program, which respectively are GREY, Gaussian and Extend.

- Mutex Lock

I use the mutex lock in this first assignment. I use it to control Grey and Gaussian. Because we need to wait for GREY, so that we can do the Gaussian blur. I lock the Gaussian function, when I do the Grey, after finish Grey, I release the lock, so that Gaussian function can work.

```
void *grey( void *ptr )
{
    pthread_mutex_t* mutex = ((info *)ptr)->mutex;
    pthread_mutex_lock( mutex );

    }
    pthread_mutex_unlock( mutex );
}
```

Hw3-2

- Number of threads: $5 \times 16 \times 5 = 400$ threads
5: There are 5 files in this program. I open 5 threads for each file.
16: I divide each image into 16 parts. Because the image width and height could be divided by 4.
5: There are three main parts in this program, which respectively are Gx, Gy, Grey, calculate and Extend.
• Semaphore Lock
I use the Semaphore lock in this second assignment. I use it to control calculate and Extend. Because we need to wait for calculate, so that we can do the Extend. I lock the Extend function, when I do the calculate, after finish calculate, I release the lock, so that Extend function can work.

Your speed:

Speed up: Hw1: >2 Hw2: >2

```
> g++ -std=c++11 -pthread 0410001_hw3-1.cpp
> ./a.out
> ./MAE.out ANS/Blur1.bmp Blur1.bmp
MAE = 0
> sh Speed.sh
Input a number of times to run './a.out' : 10

Run time:
  Finished once.
  Avg time: 851557 µs
> g++ -std=c++11 -pthread 0410001_hw3-2.cpp
> ./a.out
> ./MAE.out ANS/Sobel1.bmp Sobel1.bmp
MAE = 7.45416
> g++ -std=c++11 -pthread 0410001_hw3-2.cpp
> sh Speed.sh
Input a number of times to run './a.out' : 10

Run time:
  Finished once.
  Avg time: 790685 µs
> █
```

Problems encountered and solutions:

This is really a challenging lab for me. I don't know why. I think my logic is right however when I code and run it. It always has the problem that Segment Fault. I spent almost two whole days to deal with it. Finally, I got the answer that we need to keep track of every memory we use, especially when we use thread, and also static variable is also should be used carefully. I learn very much in this lab. If it is possible, I hope I can know the best solution for this assignment. Thank you.