Programming Problems 1110590450 歐佳昀

Chap. 4

- 4.27*: The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8, … . Formally, it can be expressed as:

  fib0=0

  fib1=1

  fibn=fibn-1+fibn-2

This program should work as follows:

- On the command line, the user will enter the number of Fibonacci numbers that the program is to generate
- The program will then create a separate thread that will generate the Fibonacci numbers, placing the sequence in data that can be shared by the threads (an array is probably the most convenient data structure)
- When the thread finishes execution, the parent thread will output the sequence generated by the child thread
- Because the parent thread cannot begin outputting until the child finishes, the parent will have to wait for the child thread to finish

./fib.out

[optional] (4.24**): An interesting way of calculating pi is to use a technique known as Monte Carlo, which involves randomization. This technique works as follows:

- Suppose you have a circle inscribed within a square, (Assume that the radius of this circle is 1.)
- First, generate a series of random points as simple (x,y) coordinates
- These points must fall within the Cartesian coordinates that bound the square
- Of the total number of random points that are generated, some will occur within the circle

- Next, estimate pi by performing the following calculation:
  Pi=4*(number of points in circle) / (total number of points)

Write a multithreaded version of this algorithm that creates a separate thread to generate a number of random points.

- The thread will count the number of points that occur within the circle and store that result in a global variable.
- When this thread has exited, the parent thread will calculate and output the estimated value of pi.

```
./monte.out
```

```
ou_chia_1@DESKTOP-BBILUN8:/mnt/c/Users/USER/OneDrive - 逢甲大學/桌面/OS_H2/personal_program/ch4_24$ ./monte 14000
param = 14000
pi = 3.139143
```

6.33*: Assume that a finite number of resources of a single resource type must be managed.

- Processes may ask for a number of these resources and will return them once finished.

- As an example, many commercial software packages provide a given number of licenses, indicating the number of applications that may run concurrently.

- When the application is started, the license count is decremented.

- When the application is terminated, the license count is incremented.

- If all licenses are in use, requests to start the application are denied.

- Such a request will be granted only when an existing license holder terminates the application and a license is returned.

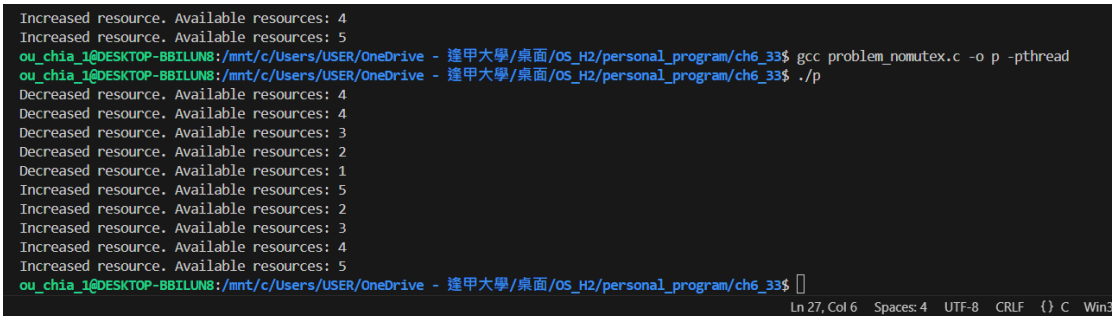
Ex.

```
#define MAX_RESOUCRES 5
int available_resources = MAX_RESOURCES;
int decrease count(int count) {
        if (available resources < count)
                return -1;
        else {
                available resources -= count;
                return 0;
                    }
```

```
    }
    int increase count(int count) {
       available resources += count;
       return 0;
    }
```

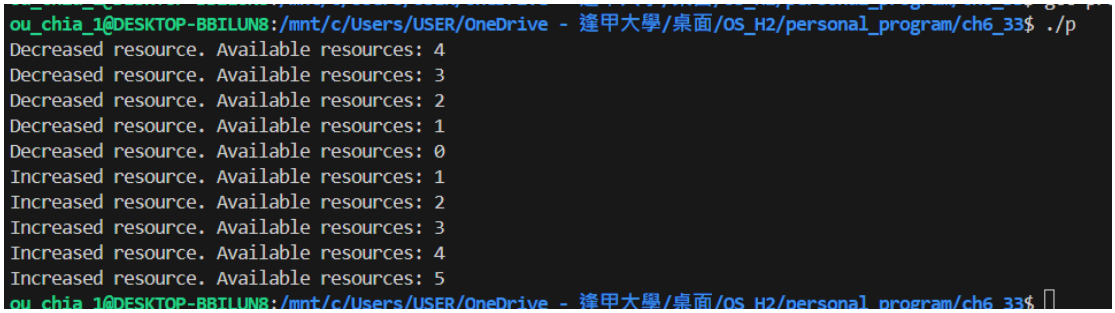
For no use mutex

```
./nomutex.out
```

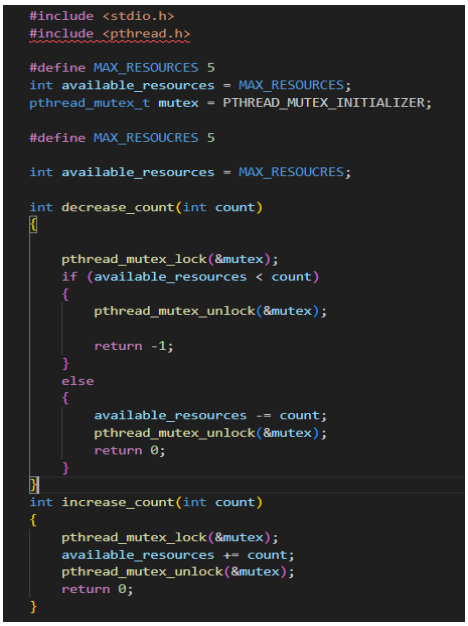


For use mutex

```
./mutex.out
```



For change location



```c
#include <stdio.h>
#include <pthread.h>

#define MAX_RESOURCES 5
int available_resources = MAX_RESOURCES;
pthread_mutex_t mutex = PTHREAD_MUTEX_INITIALIZER;

#define MAX_RESOUCRES 5

int available_resources = MAX_RESOUCRES;

int decrease_count(int count)
{

    pthread_mutex_lock(&mutex);
    if (available_resources < count)
    {
        pthread_mutex_unlock(&mutex);

        return -1;
    }
    else
    {
        available_resources -= count;
        pthread_mutex_unlock(&mutex);
        return 0;
    }
}
int increase_count(int count)
{
    pthread_mutex_lock(&mutex);
    available_resources += count;
    pthread_mutex_unlock(&mutex);
    return 0;
}
```