CSE Project 3: Matrix Multiplication

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Abstract

This is the report for my CSE course project 3: Matrix Multiplication in SJTU. In this project, I created a C program to calculate the product of two matraces which used the Pthread API to realize multithreading programming.

1 Project Description

For this project, we are required to calculate the product of two matrices with each element of the result being calculated in a separate worker thread. This will involve three steps:

- creating M * N worker threads.
- passing each thread the parameters and calculate each element separately.
- synchronizing among multiple threads and waiting for all of them to complete.

As we learned in the course before, there are three threading APIs: Win32, Pthread and Java threads. Any of them can complete the task, and the process is similar except for a few variations. Here I implemented the project using Pthread on Linux.

2 Implementation

The textbook provided some part of the codes needed. Using the APIs in Pthread like pthread_exit, pthread_create, pthread_join, first create M * N threads for each element then define a function for every thread to calculate its own result and finally join them together and print out the result.

3 Problems and Solutions

This project is based on the Pthread API, so before implementing it, I looked up some documents on it and learned about some of its important functions and their usage. After understanding them, the programming process is quite smooth.
Another thing to mention is the command for building the c file on Linux. If we simply use *gcc MatrixMultiplication.c*, the terminal will show error about Pthread. To solve it, simply use *gcc MatrixMultiplication.c -lpthread*.

4 Source Code

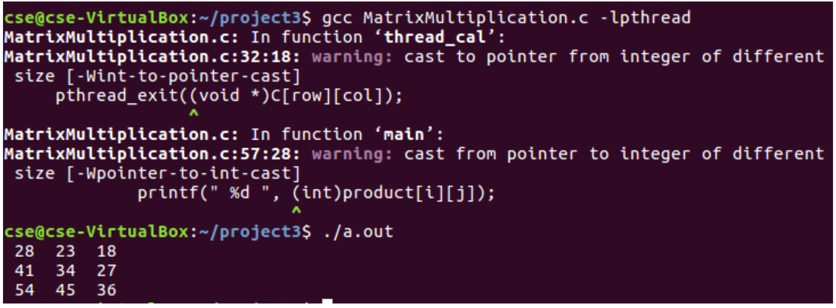
See the file **MatrixMultiplication.c**.

5 Conclusion

In conclusion, this project emphasizes on our knowledge about threading issues. By this project, I get more familiar about the practical methods to use threads to solve problems and also have a deeper understanding on threads.

6 Test

This is a snapshot for running the program on Linux:



```
cse@cse-VirtualBox:~/project3$ gcc MatrixMultiplication.c -lpthread
MatrixMultiplication.c: In function ‘thread_cal’:
MatrixMultiplication.c:32:18: warning: cast to pointer from integer of different
 size [-Wint-to-pointer-cast]
     pthread_exit((void *)C[row][col]);
                  ^
MatrixMultiplication.c: In function ‘main’:
MatrixMultiplication.c:57:28: warning: cast from pointer to integer of different
 size [-Wpointer-to-int-cast]
             printf(" %d ", (int)product[i][j]);
                            ^
cse@cse-VirtualBox:~/project3$ ./a.out
 28  23  18
 41  34  27
 54  45  36
```