

Homework 2 Report - CSE344

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1 Composition

I made this project fairly lightweight. There are `utils.h`, `utils.c` and `main.c` files that perform everything needed.

2 Program logic

In this homework there were 2 main problems. First one was to synchronize communication between parent and its child processes. In order to do that I used `SIGUSR1` and `SIGUSR2` signals whilst using `sigsuspend` system call. First of all basic handlers are installed and masks are set to block `SIGUSR1` for parent and `SIGUSR2` for children. I made shortcut functions for these things so that the code would be more readable. After that I made 8 children in a for loop where each time the parent would be suspended until that child is finished with its first task. After executing their first child all the children are suspended and are waiting for the `SIGUSR2` to be sent from parent. Parent sends that signal after it made 8 children to all of them. After that parent is suspended and is waiting for all the children to terminate. That is controled using a handler for `SIGCHLD` signal in which `waitpid` systemcall is used in order to count the number of terminated children.

The next problem regarding systems programming I faced was manipulating the file. In order to insert at the end of the row for each child I used a systemcall `ftruncate()` to make space for the Lagrange interpolation's calculation.

Another problem I stumbled upon was when children were access the file. First `lseek()` was need in order to keep everything clean and each time child uses this process the file descriptor would go back to start.

Another one was when multiple children were trying to access and write to file. In order to make that process run smoothly I used file locks for writing the result to a file.

3 Testing

I tested this program using the example file provided

- Test 1: Checking the program using the example file provided

```
electron@electron-Lenovo-ideapad-Y700-15ISK:~/Desktop/3.2 GTU/CSE344 - Systems programming/Homeworks/Homework 2/hw2 (1)
$ gcc -Wall main.c utils.c -lm
electron@electron-Lenovo-ideapad-Y700-15ISK:~/Desktop/3.2 GTU/CSE344 - Systems programming/Homeworks/Homework 2/hw2 (1)
$ ./a.out example
Error of polynomial of degree 5: 23.6
Polynomial 4: -0.0 0.4 -6.0 40.1 -134.7 211.1 -109.8
Polynomial 2: -0.0 0.0 -0.4 2.0 -1.7 -8.4 16.6
Polynomial 3: 0.1 -1.8 24.3 -167.8 615.2 -1125.8 799.0
Polynomial 7: 0.0 -0.3 3.2 -20.6 69.4 -113.3 70.6
Polynomial 6: -0.0 0.8 -14.2 134.7 -688.5 1791.2 -1836.3
Polynomial 0: -0.0 1.6 -22.2 153.0 -547.0 917.6 -491.0
Polynomial 5: -0.0 0.1 -1.5 12.1 -48.3 89.3 -51.7
Polynomial 1: -0.0 0.2 -2.0 9.9 -26.5 37.5 -13.0
Error of polynomial of degree 6: 9.7
electron@electron-Lenovo-ideapad-Y700-15ISK:~/Desktop/3.2 GTU/CSE344 - Systems programming/Homeworks/Homework 2/hw2 (1)
$
```

Figure 1: Test1