

CSE 344 – SYSTEM PROGRAMMING

HW2 - Process creation, waiting and signals

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- **Main function:**

Firstly I'm creating a sigaction as empty and assigning SIGINT. When user press to "ctrl+c" calling handler function freeing memory and exiting from system.

Secondly I am taking arguments from command with getopt() function and checking is it okey. If format is not okey then giving error and exiting with failure.

After that I am opening files.

Input file opening just reading "fdInput=open(inputFile,O_RDONLY);" if something is wrong when opening giving error and exiting with failure.

Output file opening reading and writing. Also added some mode :

```
fdOutput=open(outputFile,O_RDWR | O_CREAT | O_TRUNC | O_APPEND,  
S_IRUSR | S_IWUSR | S_IWGRP | S_IWOTH)==-1
```

creating if there is not file with this name, and removing it's contain with O_TRUNC there is file with this name and has somethings. Opening with O_APPEND mode because we are adding to end of the file. Adding new mode as rw—w—w-

Creating double array for with malloc "pos[i] = (char*)malloc(3 * sizeof(char));" This is for sending childs as a environment.

Reading char by char and assign to pos from file. When arrived each 30 character creating a child with fork. Checking is created and giving error is not. When child created set last element of pos as null and calling execve: "execve("./covarianceMatrix", argv, pos) == -1" argv for output file and pos for environments.

CovarianceMatrix.c

After fork and exec functions covarianceMatrix is running. When main function start creating sigaction. Because when user push to ctrl+c all children freeing memory, closing files and exiting. After all child do that parent freeing memory, closing files and removing output file.

Opening file for write and append end of the file. "outputFd = open(argv[4], O_WRONLY | O_APPEND);" If there is an error giving error as the others. Locking file for using. So other children can not reach and use same file at the same time. Prevent confusing who is going to write.

Then calculating covariance matrix and writing matrix to file as matrix.

```

416 333 -20
333 765 -20
-20 -20 203

503 -39 7
-39 991 6
7 6 898

58 -92 -24
-92 986 68
-24 68 61

387 347 -8
347 624 -12
-8 -12 103

682 0 -24
0 118 384
-24 384 979

```

When all calculation done returning to process.c and collecting all data from output file. Then calculating each Frobenius Norm and finding differences.

```

Reached EOF, collecting outputs from out.txt
The closest 2 matrices are {{{585,-91,-35},{-91,521,-14},{-35,-14,102}}}
is 0.423340.
==4688==
==4688== HEAP SUMMARY:
==4688==    in use at exit: 0 bytes in 0 blocks
==4688== total heap usage: 13 allocs, 13 frees, 1,076 bytes allocated
==4688==
==4688== All heap blocks were freed -- no leaks are possible
==4688==
==4688== For lists of detected and suppressed errors, rerun with: -s
==4688== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
viper@ubuntu:~/Desktop/System programming/2022/hw2$

```

What did I do for some special?

I used sigaction. Catching signal and freeing memory, closing files and exiting. For this firstly children running and parent process waiting all exiting from system. After all children is done parent process exiting.

```

"fprintf(stderr, "Process %ld received signal %d (%s)\n", (long) getpid(), sig, strsignal(sig));"

```

```

^CProcess 4552 received signal 2 (Interrupt)
Process 4556 received signal 2 (Interrupt)
Process 4551 received signal 2 (Interrupt)
Process 4553 received signal 2 (Interrupt)
Process 4550 received signal 2 (Interrupt)
Process 4554 received signal 2 (Interrupt)
Process 4547 received signal 2 (Interrupt)
Process 4557 received signal 2 (Interrupt)
Process 4549 received signal 2 (Interrupt)
Process 4548 received signal 2 (Interrupt)
Process 4546 received signal 2 (Interrupt)
Process 4543 received signal 2 (Interrupt)
Process 4573 received signal 2 (Interrupt)
Process 4567 received signal 2 (Interrupt)
Process 4576 received signal 2 (Interrupt)
Process 4575 received signal 2 (Interrupt)
Process 4577 received signal 2 (Interrupt)

```

Errors

I usually used perror for giving error, but in the handler used stderr with fprintf.

Also I used fprintf with stdout for output. Print to screen The output as giving in pdf.

```

Process 4638 reading out/input.txt
Created 4639 with (71,101,110),(101,114,97),(116,105,110),(103,32,114),(97,110,100),(111,109,32),(112,97,114),(97,103,114),(97,112,104),(115,32,0)
Created 4642 with (111,119,32),(103,111,105),(110,103,32),(97,116,32),(116,104,101),(32,98,101),(103,105,110),(110,105,110),(103,32,111),(102,32,116)
Created 4640 with (99,97,110),(32,98,101),(32,97,110),(32,101,120),(99,101,108),(108,101,110),(116,32,119),(97,121,32),(102,111,114),(32,119,114)
Created 4649 with (101,110,103),(101,115,46),(32,84,104),(101,32,119),(114,105,116),(101,114,32),(99,97,110),(32,117,115),(101,32,116),(104,101,32)
Created 4661 with (32,116,111),(32,105,110),(99,111,114),(112,111,114),(97,116,101),(32,116,104),(101,32,112),(97,114,97),(103,114,97),(112,104,32)
Created 4663 with (97,114,97),(103,114,97),(112,104,32),(99,97,110),(32,97,108),(115,111,32),(98,101,32),(97,110,32),(101,120,99),(101,108,108)
Created 4671 with (99,104,32),(116,111,32),(98,101,103),(105,110,44),(32,105,116),(32,99,97),(110,32,116),(97,107,101),(32,100,111),(119,110,32)
Reached EOF, collecting outputs from out.txt
The closest 2 matrices are {{{585,-91,-35},{-91,521,-14},{-35,-14,102}} and {{{607,-13,-17},{-13,512,-21},{-17,-21,102}}} , and their distance is 0.423340.
viper@ubuntu:~/Desktop/System_programming/2022/hw2$

```