CSE 344 - System Programming
Homework #4

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May 19, 2021

1 How did I solve this problem?

Firstly, i checked number of arguments. If number of arguments are not equal to 4, i printed an error and exit.
Also if third argument is not a positive number(money), i printed an error and exit.
And then i check whether the first and second argument is a valid file or not.

After check these situations, i find the number of student to hire. Then i store the student's values in a struct that name is 'student'.

After that, i initiate semaphores that i need.

After that i create student threads for each student. And then,

In the Main Thread;
I create a Thread H that will store the homeworks in a queue. I poll the queue and thanks to returned char value i select a student in order to hire. The student is choosen if the money is enough. If it is not, the student thread is terminated. If all homeworks are finished, all student threads are terminated.

In Student Thread;
Firstly, i send the index of student while it was created. In this way, I find the student's values in the struct of 'student'. I find sleep time of the thread. And then i use a while loop that checks whether all homeworks are finished or not. And then the thread is WAIT state with the semaphore. (A semaphore is created for each student thread.) If the semaphore's value is incremented by main thread, the student thread does the homework.

And the money is decremented by the thread and some variables is changed. Then, the thread is slept by 'sleep' function.

2 My Design Decisions

I create a 'student' struct so that i store student's data.

I use a Queue Array in the main thread to store homeworks.

I use semaphores in order to solve any synchronization issues.

I use pthreads.

I use some global variables to solve some issues.

3 Requirements I achieved and which I have failed

I think I achieved almost all the requirements. However, I may not have been able to achieve some requirements.

4 My Files

171044014_helper_hw4.h ⇒ The helper functions
171044014_func_hw4.h ⇒ The function definitions headers
171044014_func_hw4.c ⇒ The functions i have used
171044014_hw4.c ⇒ The Main C File
171044014_report.pdf ⇒ The Report PDF
171044014_report.tex ⇒ The Report Latex file
Makefile ⇒ The Makefile

5 Some screenshots from the program


```
harunalbayrak@harunalbayrak:~/Desktop/system/hw4$ ./program homeworkFile studentsFile 10000
odtulu is waiting for a homework
bogazicili is waiting for a homework
itulu is waiting for a homework
ytulu is waiting for a homework
sakaryali is waiting for a homework
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
H has a new homework Q; remaining money is 10000
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
H has a new homework Q; remaining money is 10000
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
sakaryali is solving homework X for 150, H has 9850 TL left.
bogazicili is solving homework X for 1000, H has 8850 TL left.
H has a new homework Q; remaining money is 8850
H has no other homeworks terminating.
odtulu is solving homework X for 900, H has 7950 TL left.
ytulu is solving homework X for 650, H has 7300 TL left.
itulu is solving homework X for 800, H has 6500 TL left.
bogazicili is waiting for a homework
bogazicili is solving homework X for 1000, H has 5500 TL left.
ytulu is waiting for a homework
itulu is waiting for a homework
ytulu is solving homework X for 650, H has 4850 TL left.
itulu is solving homework X for 800, H has 4050 TL left.
bogazicili is waiting for a homework
bogazicili is solving homework X for 1000, H has 3050 TL left.
No more homeworks left or coming in, closing.
Homeworks solved and money made by the students:
odtulu 1 900
bogazicili 3 3000
itulu 2 1600
ytulu 2 1300
sakaryali 1 150
Money left at H's account: 3050 TL
```

Figure 1: First run

3

```
harunalbayrak@harunalbayrak:~/Desktop/system/hw4$ ./program homeworkFile studentsFile 10000
bogazicili is waiting for a homework
odtulu is waiting for a homework
itulu is waiting for a homework
sakaryali is waiting for a homework
ytulu is waiting for a homework
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
H has a new homework Q; remaining money is 10000
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
H has a new homework Q; remaining money is 10000
H has a new homework C; remaining money is 10000
H has a new homework S; remaining money is 10000
H has a new homework Q; remaining money is 10000
H has no other homeworks terminating.
sakaryali is solving homework X for 150, H has 9850 TL left.
odtulu is solving homework X for 900, H has 8950 TL left.
ytulu is solving homework X for 650, H has 8300 TL left.
bogazicili is solving homework X for 1000, H has 7300 TL left.
bogazicili is waiting for a homework
bogazicili is solving homework X for 1000, H has 6300 TL left.
ytulu is waiting for a homework
ytulu is solving homework X for 650, H has 5650 TL left.
bogazicili is waiting for a homework
bogazicili is solving homework X for 1000, H has 4650 TL left.
odtulu is waiting for a homework
odtulu is solving homework X for 900, H has 3750 TL left.
bogazicili is waiting for a homework
bogazicili is solving homework X for 1000, H has 2750 TL left.
No more homeworks left or coming in, closing.
Homeworks solved and money made by the students:
odtulu 2 1800
bogazicili 4 4000
itulu 0 0
ytulu 2 1300
sakaryali 1 150
Money left at H's account: 2750 TL
```
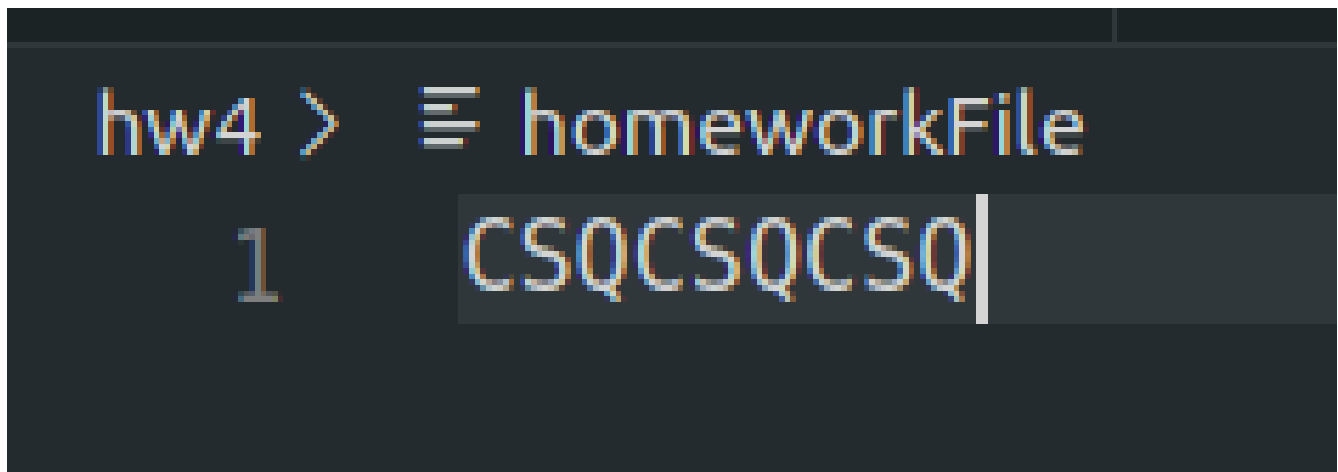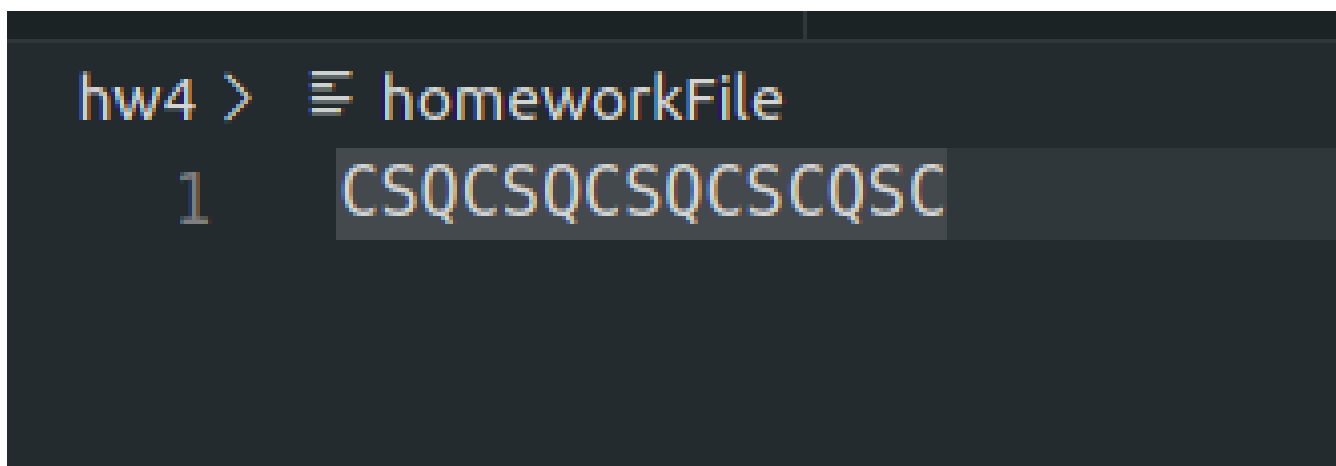
Figure 2: Second run

Figure 3: The file in the first and second run

Figure 4: Third run

Figure 5: The file in the third run