Homework 4

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Problem Solution Approach

This problem was bit easier than other problems. It is a basic producer, consumer problem but enchanes to use System V semaphores and threads.
It is very same as previous homework. But we use threads and System V semaphores instead of POSIX semaphores and processes.

My Approach

I created my semaphores with `IPC_PRIVATE` for creating new semaphores instead of existing file like semaphores.

After than, I initialize my semaphroes with array. After, I create my producer and consumer threads.

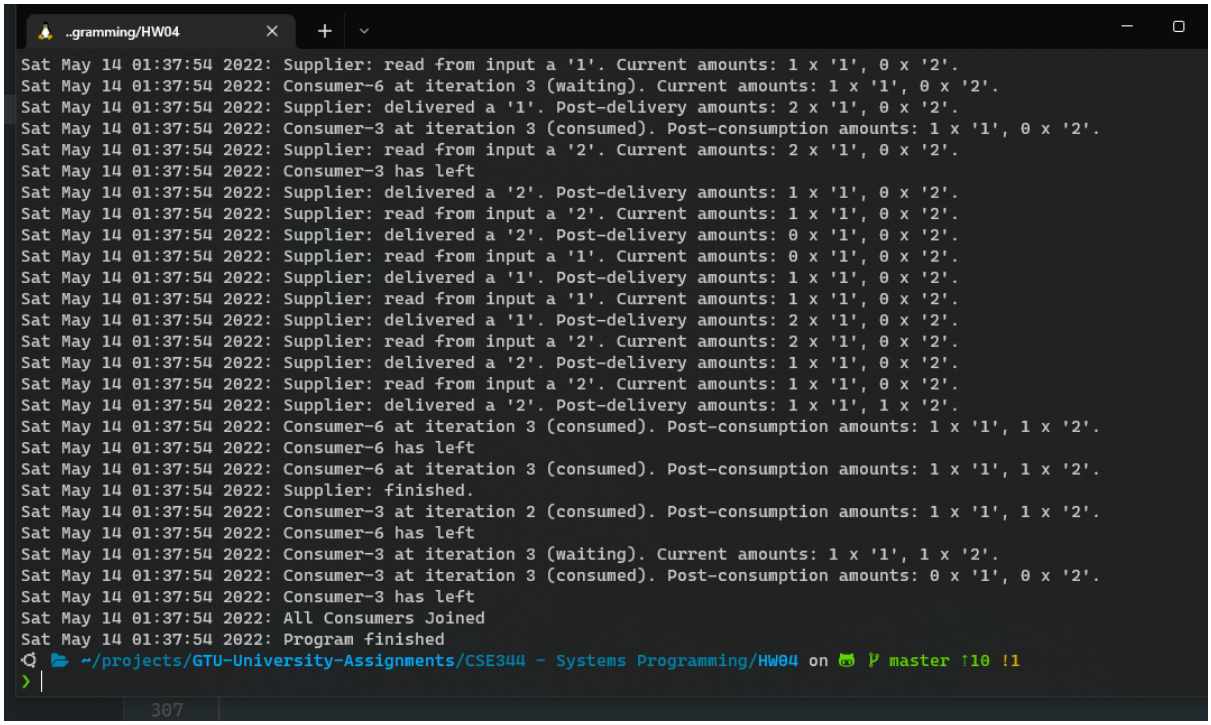
Producer thread is detached thread and can not be joinable. But I joined consumer processes.

For avoiding producer thread finishing work without finishing parent thread, I exit with `pthread_exti(0)` to achieve the goal.

Validation for homework

With given input file, My program handles one ‘1’ and one ‘2’ without any problem.

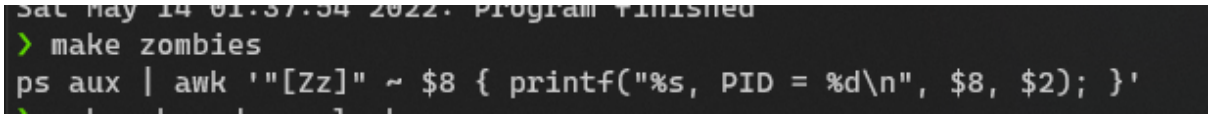
Running Results



Leak results

After running `make shared_mem_leak`a, `make_zombies` and `make_memory`, there is no un freed or zombie or unlinked shared mem or unfreed semaphore

Zombie result



Shared Mem Result

```
ps aux | awk '"[22]" ~ $8 { printf("%s, PID = %d\n", $8, $2); }'
❯ make shared_mem_leak
ipcs

------ Message Queues --------
key        msqid      owner      perms      used-bytes   messages

------ Shared Memory Segments --------
key        shmid      owner      perms      bytes      nattch     status

------ Semaphore Arrays --------
key        semid      owner      perms      nsems

ls /dev/shm -a
.  ..
 ~/projects/GTU-University-Assignments/CSE344 - Systems Programming/HW04 on
❯
```

Valgrind Result

```
Sat May 14 01:39:07 2022: Supplier: read from input a '2'. Current amounts: 1 x '1', 0 x '2'.
Sat May 14 01:39:07 2022: Supplier: delivered a '2'. Post-delivery amounts: 0 x '1', 0 x '2'.
Sat May 14 01:39:07 2022: Consumer-5 at iteration 3 (consumed). Post-consumption amounts: 0 x '1', 0 x '2'.
Sat May 14 01:39:07 2022: Supplier: finished.
Sat May 14 01:39:07 2022: Consumer-4 at iteration 3 (consumed). Post-consumption amounts: 0 x '1', 0 x '2'.
Sat May 14 01:39:07 2022: Consumer-5 has left
Sat May 14 01:39:07 2022: Consumer-4 has left
Sat May 14 01:39:07 2022: All Consumers Joined
Sat May 14 01:39:07 2022: Program finished
==1271==
==1271== HEAP SUMMARY:
==1271==     in use at exit: 0 bytes in 0 blocks
==1271==   total heap usage: 357 allocs, 357 frees, 184,029 bytes allocated
==1271==
==1271== All heap blocks were freed -- no leaks are possible
==1271==
==1271== For lists of detected and suppressed errors, rerun with: -s
==1271== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
 ~/projects/GTU-University-Assignments/CSE344 - Systems Programming/HW04 on  master ↑10 !1
❯
```

Quick Tip for Checking Big Data

In my makefile file, there is a line

Makefile

```
CC = gcc      You, 23 hours ago • Add hw04 initial files …
CFLAGS =-Wextra -Wall -lrt -lpthread -pthread

UTILS_SRC = src/utils.c
UTILS_HEADER = include/utils.h

MAIN = main.c

# You can change args value due to more complex exmaple
SIMPLE = -C 6 -N 4 -F data/simple.txt
COMPLEX = -N 80 -C 80 -F data/complex.txt

# Change this
ARGS = $(SIMPLE)

OUT = hw4
```

If you change this variable to `COMPLEX`, ıt will run bigger file with more thread and iteration count.

Missing Parts of Homework

I carefully checked my homework and it seems everything works fine.

I assumed, given file is correct and has a ‘1’ and ‘2’ size to equal like N*C count. So I don’t check them since they are mentioned in homework pdf.