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CSE 344

Midterm

1 Requirements

I have successfully implemented all the desired features in this midterm. There is no warning that comes from -Wall flag or memory leak showed by valgrind including CTRL-C interruption signal.

2 Design Decisions

a.) In this assigment I use shared memory, pipes and unnamed semaphores to synchronization.

b.) Since nurses read file one by one, there is a relationship between vaccinators and nurses, producer/consumer paradigm.

c.) I used 4 unnamed semaphore in order to synchronization full,empty and m semaphores for producer/consumer paradigm.Readsem semaphore for critical section some places.(Read files etc.)

d.) I used pipes for comminication between citizens and vaccinators.Citizens opens this pipes with read mode and vaccinator open this pipes write mode.Every time vaccinator writes, he invites the citizen and becomes the vaccine.It continues until all the vaccinations are over.In this part i also used semaphores.

e.) I created the int volatile style global variable. I am changing this variable when the ctrl-c signal arrives. I use this signal where necessary, and do the desired action. When CTRL-C is pressed, the program leaves whatever it is doing, and frees the memory created by returning to the machine as soon as possible.

3 Algorithms

Nurses, Citizens and Vaccinators

First I created the citizens and store their pid in an array.For citizens i create pipes and save file file descriptors in array.When I do so, I can access their pids and file descriptors from vaccinators.Citizens opens file descriptors then wait input on read mode.

Then I created nurses to carry the vaccines one by one.Nurses uses shared memory so i used semaphore in order to make critical section.I used producer/consumer semaphore algorithm from lecture slides. Then i created vaccinators, vaccinators take the vaccine from shared memory and call citizen.After the vaccine is done, it makes the necessary numerical arrangements in shared memory using semaphores(critical section).

Since the pids in the Citizen pid array are stored according to the first creation order, the first index has the pid of the first citizen created. Since the count I keep in Shared memory, the vaccinators are vaccinated from the first to the last created citizen.After all happens once, vaccinators goes back to the beginning and starts the next vaccinate round.In this way, they are vaccinated in an orderly and in parallel way.After they're all done, they close properly.

4 Input Outputs

I tried it with many different input files.Below is a sample picture of one of the things I tried.
./main -n 3 -v 2 -c 3 -b 10 -t 3 input2

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yusuf@DESKTOP-DSIKHVV:~/hw_344/midterm$ ./main -n 3 -v 2 -c 3 -b 10 -t 3 -i input2
Welcome to the GTU344 clinic.Number of citizens to vaccinate c= 3 with t= 3 doses.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 1 vaccine1 and 0 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 1 vaccine1 and 1 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 2 vaccine1 and 1 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 2 vaccine1 and 2 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 3 vaccine1 and 2 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 3 vaccine1 and 3 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 4 vaccine1 and 3 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 4 vaccine1 and 4 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 5 vaccine1 and 4 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 5 vaccine1 and 5 vaccine2.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22656 to the clinic.
Citizen 1 (pid= 22656) is vaccinated for the 1. time : the clinic has 4 vaccine1 and 4 vaccine2.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22657 to the clinic.
Citizen 2 (pid= 22657) is vaccinated for the 1. time : the clinic has 3 vaccine1 and 3 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 4 vaccine1 and 3 vaccine2.
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 4 vaccine1 and 4 vaccine2.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22658 to the clinic.
Citizen 3 (pid= 22658) is vaccinated for the 1. time : the clinic has 3 vaccine1 and 3 vaccine2.
Nurse 3 (pid=22661) has brought vaccine 1: the clinic has 4 vaccine1 and 3 vaccine2.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22656 to the clinic.
Citizen 1 (pid= 22656) is vaccinated for the 2. time : the clinic has 3 vaccine1 and 2 vaccine2.
Vaccinator 2 (pid= 22663) is inviting citizen pid=22657 to the clinic.
Citizen 2 (pid= 22657) is vaccinated for the 2. time : the clinic has 2 vaccine1 and 1 vaccine2.
Nurse 2 (pid=22660) has brought vaccine 2: the clinic has 2 vaccine1 and 2 vaccine2.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22658 to the clinic.
Citizen 3 (pid= 22658) is vaccinated for the 2. time : the clinic has 1 vaccine1 and 1 vaccine2.
Vaccinator 2 (pid= 22663) is inviting citizen pid=22656 to the clinic.
Citizen 1 (pid= 22656) is vaccinated for the 3. time : the clinic has 0 vaccine1 and 0 vaccine2.
The citizen is leaving.Remaining citizens to vaccinate : 2
Nurse 1 (pid=22659) has brought vaccine 1: the clinic has 1 vaccine1 and 0 vaccine2.
Nurse 3 (pid=22661) has brought vaccine 2: the clinic has 1 vaccine1 and 1 vaccine2.
Nurse 2 (pid=22660) has brought vaccine 1: the clinic has 2 vaccine1 and 1 vaccine2.
Vaccinator 2 (pid= 22663) is inviting citizen pid=22657 to the clinic.
Citizen 2 (pid= 22657) is vaccinated for the 3. time : the clinic has 1 vaccine1 and 0 vaccine2.
The citizen is leaving.Remaining citizens to vaccinate : 1
Nurse 1 (pid=22659) has brought vaccine 2: the clinic has 1 vaccine1 and 1 vaccine2.
Nurses have carried all vaccines to the buffer, terminating.
Vaccinator 1 (pid= 22662) is inviting citizen pid=22658 to the clinic.
Citizen 3 (pid= 22658) is vaccinated for the 3. time : the clinic has 0 vaccine1 and 0 vaccine2.
The citizen is leaving.Remaining citizens to vaccinate : 0
All citizens have been vaccinated.
Vaccinator 1 (pid=22662) vaccinated 6 doses.
Vaccinator 2 (pid=22663) vaccinated 3 doses.

The clinic is now closed.Stay healthy.
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