Gebze Technical University
Computer Engineering

CSE 344 - 2021 Spring

MIDTERM REPORT

BERKE SÜSLÜ
161044076

1 INTRODUCTION

1.1 Problem Definition

Simple Covid-19 vaccination simulation with producer/consumer paradigm.

1.2 System Requirements

Any computer with Ubuntu 14.04 LTS 32-bit Operating System.

2 METHOD

2.1 Problem Solution Approach

Firstly, the program reads the parameters using getopt(). Then, it checks inputs are valid or not. If there is an invalid input, program tells invalid input and exits. After that, program creates shared memory segments.All semaphore, critical region, pid of processes etc. is in the shared memory.Also program opens the input file before creating child processes. Then, program creates $n+v+c$ child process.When all child processes are created, the parent process send a signal (SIGUSR1) to wake up all nurses and vaccinators.
Nurse:
The nurse processes read the input file and add into buffer in the shared memory. (The buffer is basically 2 integer variable.) There are 4 semaphore is used in order to synchronize processes. The usage of semaphores is mostly same as examples in the slides of this course. (Realize the nurses are producer) Also I did not use a semaphore to reading file because there are no race condition.(The processes works as cooperative) When reading file is finished, the last nurse process prints the terminate message and terminates.
Vaccinator:
The vaccinator processes wait until there are enough vaccine in the buffer.(at least 1 vaccine1 and 1 vaccine2 in the buffer).Synchronization is made using semaphore again.(Realize the vaccinators are consumer) When there are enough vaccine in the buffer, vaccinator calls the citizen process using signals (SIGUSR1) with priority queue(only the first dose of vaccine,the other dose are randomly) and waits citizen process.(In order to send citizen away.)

When the citizen process wakes the vaccinator,repeat this steps until all citizen is vaccinated t times.After that, the number of vaccinated doses is sent to main process and the vaccinators terminate.
Citizen:
The citizen processes are waiting a signal from vaccinator.When the signal is catched, the citizen processes prints the message and wake up the vaccinator who wakes him.After the citizen vaccinated t times,the citizen prints remaining citizen and terminates.

When all child processes terminates, the parent processes prints the exit message, frees all resources and terminates.

3 RESULT

3.1 Test Cases

I used an example input file (9 vaccine1 and 9 vaccine2) with some parameters and checked with valgrind for memory leaks.

3.2 Running Results

With n:3 v:2 c:3 b:11 t:3 i:inputpath(includes 9 vaccine1 and 9 vaccine2)

```
Welcome to the GTU344 clinic. Number of citizens to vaccinate c=3 with t=3 doses.
Nurse 2 (pid=83) has brought vaccine 1: the clinic has 1 vaccine1 and 0 vaccine2.
Nurse 2 (pid=83) has brought vaccine 2: the clinic has 1 vaccine1 and 1 vaccine2.
Nurse 1 (pid=82) has brought vaccine 1: the clinic has 2 vaccine1 and 1 vaccine2.
Nurse 1 (pid=82) has brought vaccine 1: the clinic has 3 vaccine1 and 1 vaccine2.
Nurse 3 (pid=84) has brought vaccine 1: the clinic has 4 vaccine1 and 1 vaccine2.
Nurse 3 (pid=84) has brought vaccine 1: the clinic has 5 vaccine1 and 1 vaccine2.
Vaccinator 1 (pid=85) calls the citizen 87 in the clinic.
Nurse 1 (pid=82) has brought vaccine 2: the clinic has 4 vaccine1 and 1 vaccine2.
Nurse 3 (pid=84) has brought vaccine 2: the clinic has 4 vaccine1 and 2 vaccine2.
Nurse 2 (pid=83) has brought vaccine 2: the clinic has 4 vaccine1 and 3 vaccine2.
Nurse 1 (pid=82) has brought vaccine 2: the clinic has 4 vaccine1 and 4 vaccine2.
Nurse 3 (pid=84) has brought vaccine 1: the clinic has 5 vaccine1 and 4 vaccine2.
Nurse 2 (pid=83) has brought vaccine 2: the clinic has 5 vaccine1 and 5 vaccine2.
Nurse 1 (pid=82) has brought vaccine 2: the clinic has 5 vaccine1 and 6 vaccine2.
Citizen 1 (pid=87) is vaccinated for the 1 time: the clinic has 5 vaccine1 and 6 vacc
Vaccinator 2 (pid=86) calls the citizen 88 in the clinic.
Nurse 3 (pid=84) has brought vaccine 1: the clinic has 5 vaccine1 and 5 vaccine2.
Nurse 2 (pid=83) has brought vaccine 1: the clinic has 6 vaccine1 and 5 vaccine2.
Citizen 2 (pid=88) is vaccinated for the 1 time: the clinic has 6 vaccine1 and 5 vacc
Vaccinator 1 (pid=85) calls the citizen 89 in the clinic.
Nurse 3 (pid=84) has brought vaccine 1: the clinic has 6 vaccine1 and 4 vaccine2.
Nurse 1 (pid=82) has brought vaccine 2: the clinic has 6 vaccine1 and 5 vaccine2.
Citizen 3 (pid=89) is vaccinated for the 1 time: the clinic has 6 vaccine1 and 5 vacc
Vaccinator 2 (pid=86) calls the citizen 88 in the clinic.
Nurse 2 (pid=83) has brought vaccine 2: the clinic has 5 vaccine1 and 5 vaccine2.
Nurses have carried all vaccines to the buffer, terminating.
Citizen 2 (pid=88) is vaccinated for the 2 time: the clinic has 5 vaccine1 and 5 vacc
Vaccinator 2 (pid=86) calls the citizen 88 in the clinic.
Citizen 2 (pid=88) is vaccinated for the 3 time: the clinic has 4 vaccine1 and 4 vacc
The citizen 2 (pid=88) is leaving. Remaining citizens to vaccinates: 2
Vaccinator 1 (pid=85) calls the citizen 87 in the clinic.
Citizen 1 (pid=87) is vaccinated for the 2 time: the clinic has 3 vaccine1 and 3 vacc
Vaccinator 1 (pid=85) calls the citizen 87 in the clinic.
Citizen 1 (pid=87) is vaccinated for the 3 time: the clinic has 2 vaccine1 and 2 vacc
The citizen 1 (pid=87) is leaving. Remaining citizens to vaccinates: 1
Vaccinator 2 (pid=86) calls the citizen 89 in the clinic.
Citizen 3 (pid=89) is vaccinated for the 2 time: the clinic has 1 vaccine1 and 1 vacc
Vaccinator 2 (pid=86) calls the citizen 89 in the clinic.
Citizen 3 (pid=89) is vaccinated for the 3 time: the clinic has 0 vaccine1 and 0 vacc
The citizen 3 (pid=89) is leaving. Remaining citizens to vaccinates: 0
Vaccinator 0 (pid=85) vaccinated 4 doses. Vaccinator 1 (pid=86) vaccinated 5 doses.
The clinic is now closed. Stay healthy!
```

With n:5 v:5 c:9 b:11 t:1 i:inputpath(includes 9 vaccine1 and 9 vaccine2)

```
Welcome to the GTU344 clinic. Number of citizens to vaccinate c=9 with t=1 doses.
Nurse 1 (pid=109) has brought vaccine 1: the clinic has 1 vaccine1 and 0 vaccine2.
Nurse 2 (pid=110) has brought vaccine 1: the clinic has 2 vaccine1 and 0 vaccine2.
Nurse 5 (pid=113) has brought vaccine 1: the clinic has 3 vaccine1 and 0 vaccine2.
Nurse 3 (pid=111) has brought vaccine 2: the clinic has 3 vaccine1 and 1 vaccine2.
Nurse 4 (pid=112) has brought vaccine 2: the clinic has 3 vaccine1 and 2 vaccine2.
Nurse 1 (pid=109) has brought vaccine 1: the clinic has 4 vaccine1 and 2 vaccine2.
Nurse 2 (pid=110) has brought vaccine 2: the clinic has 4 vaccine1 and 3 vaccine2.
Nurse 5 (pid=113) has brought vaccine 1: the clinic has 5 vaccine1 and 3 vaccine2.
Vaccinator 1 (pid=114) calls the citizen 119 in the clinic.
Nurse 2 (pid=110) has brought vaccine 2: the clinic has 4 vaccine1 and 3 vaccine2.
Nurse 4 (pid=112) has brought vaccine 2: the clinic has 4 vaccine1 and 4 vaccine2.
Citizen 1 (pid=119) is vaccinated for the 1 time: the clinic has 4 vaccine1 and 4 vacc
The citizen 1 (pid=119) is leaving. Remaining citizens to vaccinates: 8
Nurse 5 (pid=113) has brought vaccine 2: the clinic has 4 vaccine1 and 5 vaccine2.
Vaccinator 2 (pid=115) calls the citizen 120 in the clinic.
Nurse 2 (pid=110) has brought vaccine 1: the clinic has 4 vaccine1 and 4 vaccine2.
Nurse 3 (pid=111) has brought vaccine 2: the clinic has 4 vaccine1 and 5 vaccine2.
Citizen 2 (pid=120) is vaccinated for the 1 time: the clinic has 4 vaccine1 and 5 vacc
The citizen 2 (pid=120) is leaving. Remaining citizens to vaccinates: 7
Nurse 1 (pid=109) has brought vaccine 1: the clinic has 5 vaccine1 and 5 vaccine2.
Vaccinator 3 (pid=116) calls the citizen 121 in the clinic.
Nurse 5 (pid=113) has brought vaccine 2: the clinic has 4 vaccine1 and 5 vaccine2.
Nurse 2 (pid=110) has brought vaccine 1: the clinic has 5 vaccine1 and 5 vaccine2.
Nurse 4 (pid=112) has brought vaccine 1: the clinic has 6 vaccine1 and 5 vaccine2.
Citizen 3 (pid=121) is vaccinated for the 1 time: the clinic has 6 vaccine1 and 5 vacc
The citizen 3 (pid=121) is leaving. Remaining citizens to vaccinates: 6
Vaccinator 4 (pid=117) calls the citizen 122 in the clinic.
Nurse 3 (pid=111) has brought vaccine 2: the clinic has 5 vaccine1 and 5 vaccine2.
Nurses have carried all vaccines to the buffer, terminating.
Citizen 4 (pid=122) is vaccinated for the 1 time: the clinic has 5 vaccine1 and 5 vacc
The citizen 4 (pid=122) is leaving. Remaining citizens to vaccinates: 5
Vaccinator 4 (pid=117) calls the citizen 123 in the clinic.
Citizen 5 (pid=123) is vaccinated for the 1 time: the clinic has 4 vaccine1 and 4 vacc
The citizen 5 (pid=123) is leaving. Remaining citizens to vaccinates: 4
```

```
Vaccinator 4 (pid=117) calls the citizen 124 in the clinic.
Citizen 6 (pid=124) is vaccinated for the 1 time: the clinic has 3 vaccine1 and 3 vacc
The citizen 6 (pid=124) is leaving. Remaining citizens to vaccinates: 3
Vaccinator 2 (pid=115) calls the citizen 125 in the clinic.
Citizen 7 (pid=125) is vaccinated for the 1 time: the clinic has 2 vaccine1 and 2 vacc
The citizen 7 (pid=125) is leaving. Remaining citizens to vaccinates: 2
Vaccinator 3 (pid=116) calls the citizen 126 in the clinic.
Citizen 8 (pid=126) is vaccinated for the 1 time: the clinic has 1 vaccine1 and 1 vacc
The citizen 8 (pid=126) is leaving. Remaining citizens to vaccinates: 1
Vaccinator 5 (pid=118) calls the citizen 127 in the clinic.
Citizen 9 (pid=127) is vaccinated for the 1 time: the clinic has 0 vaccine1 and 0 vacc
The citizen 9 (pid=127) is leaving. Remaining citizens to vaccinates: 0
Vaccinator 0 (pid=114) vaccinated 1 doses. Vaccinator 1 (pid=115) vaccinated 2 doses.
The clinic is now closed. Stay healthy!
```