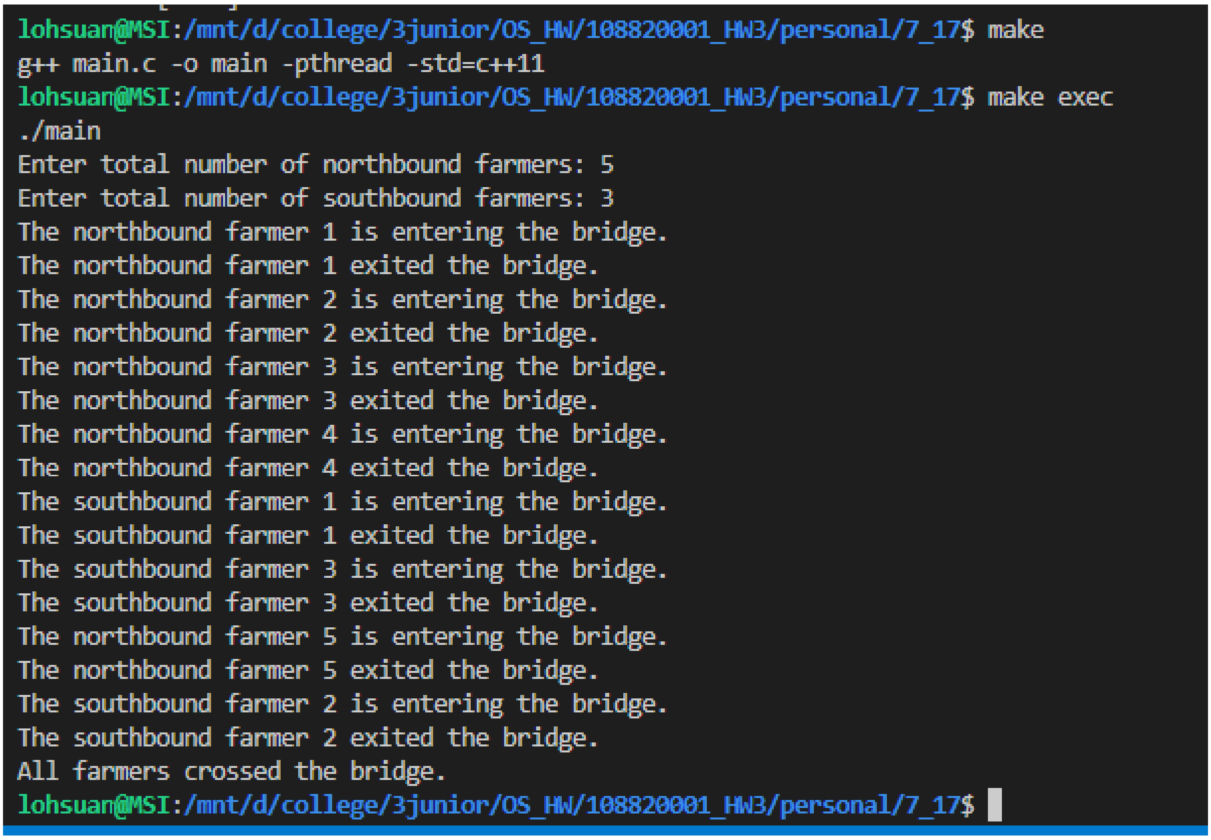
HW3 Programming Problems

Q7.17

利用 multithread 實作南北邊的農夫要通過僅一台車寬度的橋，並避免 deadlock。

How to run
1. open terminal in this directory
2. enter `make` to compile
3. enter `make exec` or `./main` to execute
4. enter `make clean` to clean up (optional)

execution snapshot



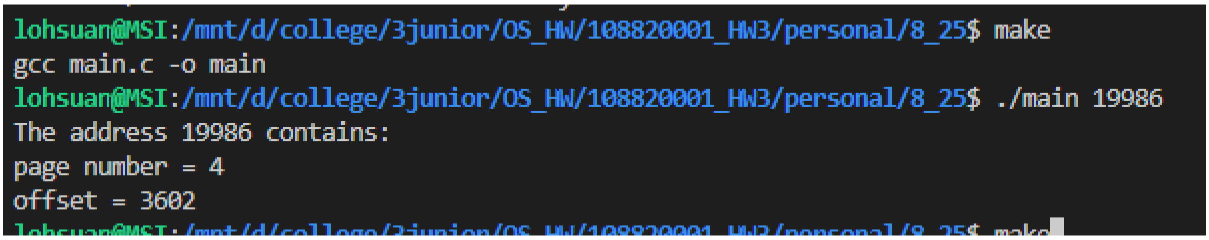
```
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/7_17$ make
g++ main.c -o main -pthread -std=c++11
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/7_17$ make exec
./main
Enter total number of northbound farmers: 5
Enter total number of southbound farmers: 3
The northbound farmer 1 is entering the bridge.
The northbound farmer 1 exited the bridge.
The northbound farmer 2 is entering the bridge.
The northbound farmer 2 exited the bridge.
The northbound farmer 3 is entering the bridge.
The northbound farmer 3 exited the bridge.
The northbound farmer 4 is entering the bridge.
The northbound farmer 4 exited the bridge.
The southbound farmer 1 is entering the bridge.
The southbound farmer 1 exited the bridge.
The southbound farmer 3 is entering the bridge.
The southbound farmer 3 exited the bridge.
The northbound farmer 5 is entering the bridge.
The northbound farmer 5 exited the bridge.
The southbound farmer 2 is entering the bridge.
The southbound farmer 2 exited the bridge.
All farmers crossed the bridge.
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/7_17$
```

Q8.25

計算 32-bit virtual address, 4-KB page size virtual memory 對應的 page number 及 offset

How to run
1. open terminal in this directory
2. enter `make` to compile
3. enter `./main <address you want to check>` to execute
4. enter `make clean` to clean up (optional)

execution snapshot



```
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/8_25$ make
gcc main.c -o main
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/8_25$ ./main 19986
The address 19986 contains:
page number = 4
offset = 3602
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/8_25$ make
```

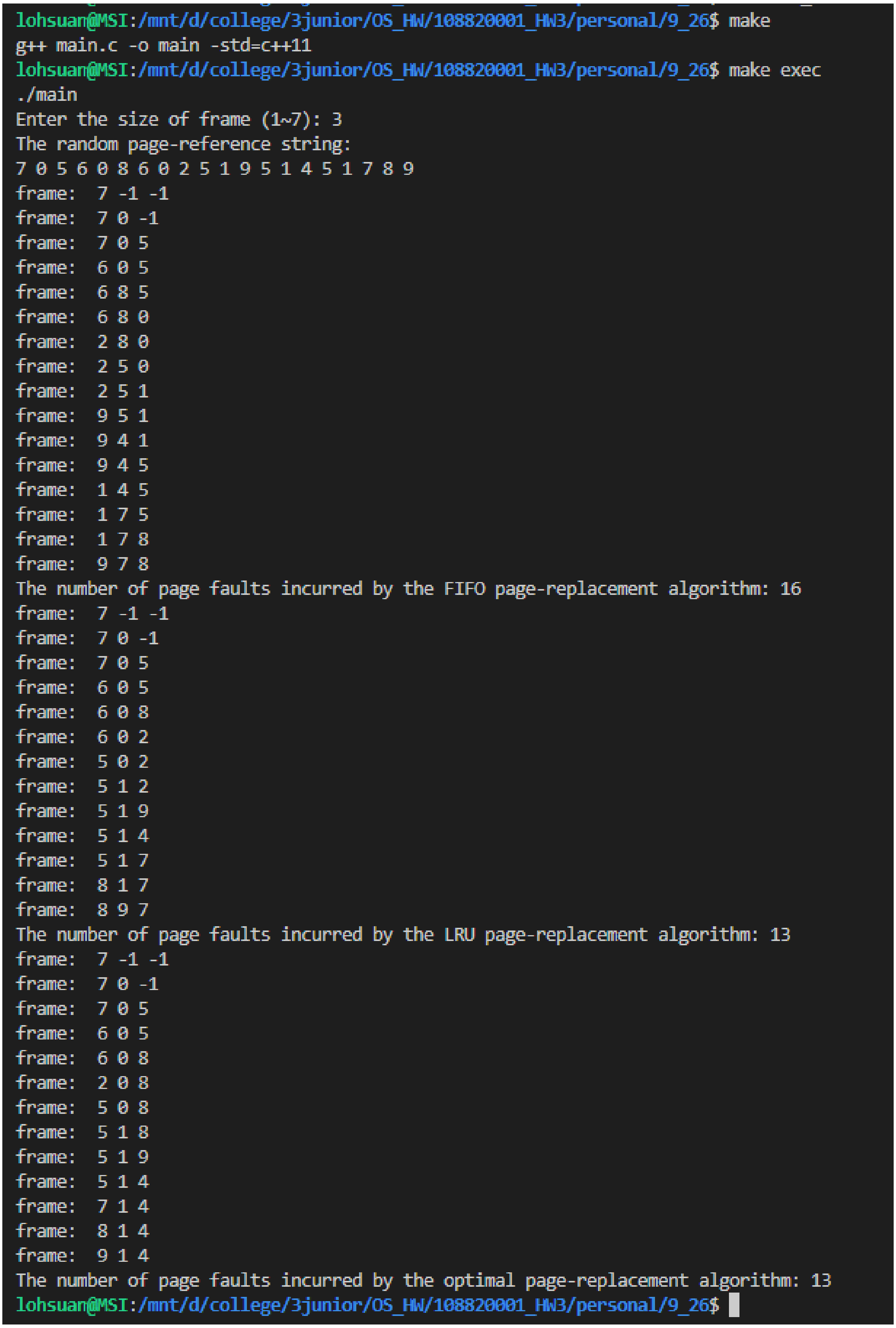
Q9.26

先產生隨機的 20 bit page-reference string，
再分別以 FIFO、LRU 和 optimal page-replacement algorithm 計算各自的 page fault。

How to run

1. open terminal in this directory
2. enter `make` to compile
3. enter `make exec` or `./main` to execute
4. enter `make clean` to clean up (optional)

execution snapshot



```
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/9_26$ make
g++ main.c -o main -std=c++11
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/9_26$ make exec
./main
Enter the size of frame (1~7): 3
The random page-reference string:
7 0 5 6 0 8 6 0 2 5 1 9 5 1 4 5 1 7 8 9
frame:  7 -1 -1
frame:  7 0 -1
frame:  7 0 5
frame:  6 0 5
frame:  6 8 5
frame:  6 8 0
frame:  2 8 0
frame:  2 5 0
frame:  2 5 1
frame:  9 5 1
frame:  9 4 1
frame:  9 4 5
frame:  1 4 5
frame:  1 7 5
frame:  1 7 8
frame:  9 7 8
The number of page faults incurred by the FIFO page-replacement algorithm: 16
frame:  7 -1 -1
frame:  7 0 -1
frame:  7 0 5
frame:  6 0 5
frame:  6 0 8
frame:  6 0 2
frame:  5 0 2
frame:  5 1 2
frame:  5 1 9
frame:  5 1 4
frame:  5 1 7
frame:  8 1 7
frame:  8 9 7
The number of page faults incurred by the LRU page-replacement algorithm: 13
frame:  7 -1 -1
frame:  7 0 -1
frame:  7 0 5
frame:  6 0 5
frame:  6 0 8
frame:  2 0 8
frame:  5 0 8
frame:  5 1 8
frame:  5 1 9
frame:  5 1 4
frame:  7 1 4
frame:  8 1 4
frame:  9 1 4
The number of page faults incurred by the optimal page-replacement algorithm: 13
lohsuan@MSI:/mnt/d/college/3junior/OS_HW/108820001_HW3/personal/9_26$ 
```