Written Report

Planing

This program can let user input room number and two ways to run the simulator.

a. When choose the Random way, the program will randomly generator patients with random urgency and treatment time, one thing to remind that although the arrive time is random, it will lager than the before one.

b. When choose the Preset way, the program will use the three patients I pre-defined.

Implementation

I have two interface, IPriorityQueue and Generator. And six classes.

a. MyPriorityQueue: implement IPriorityQueue, the inner date structure is ArrayList, every time insert a new element, it will adjust the sequence to sort it in descending order

b. Patient: Implement Comparable. Override the compareTo method by urgeLevel and ArriveTime. It also has a variable, type, to decide it is just arrive or ready to depart.

c. PatientGenerator: Implement Generator. The next method in it will return Patient, which have random arriveTime, urgeLevel and Treatment time.

d. Room: have variables finishTreat(the time when the room finish a treatment), totalPatientCount (the total number of patient who use this room), totalPatientWait(the total time patient wait of this room), TotalService (the total time this room in service), and highUrgeWait, lowUrgeWait, highUrgePatient, lowUrgePatient

e. ERSimulator:

1.UserInput method, the interface with User, will ask the User to input again if the input format is wrong;

2.nextAvailableRoom method, return the next available Room by compare the finish time variable in all rooms;

3.nextArrivePatient method, return the next arrive Patient.

4.runSimulation method, while the Pqueue(priority queue) is not null, remove a patient in the queue. First determine the patient's type.

If it is a depart type, print it and end;

If it is a arrive type, determine if there are still empty rooms. if so, directly jump to treat method; if not, insert it in Pqueue. After it, use nextArrivePatient method to generate a new patient and insert it in pqueue and if this patient arrive time bigger than simulationLength, means the hospital is closed, so we do nothing.

5.Treat method, get the nextAvailableRoom and update all the variables in this room. **The key point in the program** create a patient with this patient's ID and treatment, but update the arrivetime to finishTreat of room, and urge level 0, and type to depart. Now insert this new patient to Pqueue.

6.printResult method, print the summary.

f. ERSimulatorAPP: run ERSimulator

Testing

I have four test for patient class, patientGenerator class, MyPriorityQueue class and ERSimulator class they all works well.

Evaluate

First, I learn how to implement priority queue.

Second, I learn how to use java reflect to generator new object.

Third, at first I thought use the real time in the computer to simulator, but then I found that it is too slow and difficult to transform. So I use virtual time, and use variable in room to remember time. It is correct and fast.

Forth, I began this program by the design of two priority queue, but I can not do the time synchronization, after thinking a lot, I decide to use only one Priority Queue, and give patient two different types. And because this priority queue sort first in urge level, so I set all the left patient urge level in 0, so ,it will sort in arrive time, which I set to it actual depart time, remove again.

Last but not least, I learn to use Maven, which is really frustrated me.

Finally

I think this depend on the arrive time and the treatment time range you define. If I define the treatment range narrow and arrive time range wide, the wait time is really little. Like the following I assign treatment scope 0-80, and the arrive time differ scope 150, the result summary as following.

```
*******Summary*******
Total examination rooms are in the system: 3
Simulation Time: 8.0 hours
Total Patient Number: 9
Total Wait Time: 0 minutes
Average wait for patients with urgency levels(1-4): 0.0
Average wait for patients with urgency levels(8-9): 0.0
Average wait time: 0.0 minutes
Average duration of treatment: 38 minutes
```

Now I change the treatment scope 0-180, and the arrive time differ scope 50, the result summary as following

```
*******Summary*******
Total examination rooms are in the system: 3
Simulation Time: 8.0 hours
Total Patient Number: 17
Total Wait Time: 655 minutes
Average wait for patients with urgency levels(1-4): 0.0
Average wait for patients with urgency levels(8-9): 25.0
Average wait time: 38.0 minutes
Average duration of treatment: 92 minutes
```