Elisha Parslow

CS273 Data Structures

Final Project: Hospital Simulator

Project Specifications

Requirement Specification:

The hospital simulator is meant to simulate one week’s time in an emergency room based on the user’s desired input. The user has the option to select how many patients arrive per hour, up to sixty patients, as well as how many doctors and how many nurses are working during the week. Before the user enters this data, the text files of all 2000 people’s names being simulated in CS273ville will be opened and put into first name and last name vectors for use later. After the program asks the user for this information through the function EnterData() inside the EmergencyRoom class, the program will then set the user entered numbers for use in the waitingRoomQueue. After this function is completed, the program will access the runGreysAnatomySimulation() function inside of the EmergencyRoom class to move patients through the queues to be treated in the emergency room.

Inside the simulation function, based on clock time of every second, the function will try to addToQueue() inside waitingRoomQueue. Inside this function, odds will be determined of a patient entering that minute based on what the user entered for patientsPerHour in comparrision to a random number generated from the RandomsGenerator class. If patientsPerHour is larger than the random number, the function will then generate another random number between 1 and 2000 to grab a first and last name from the vectors of names. It then will push a new Patient into the waitingRoomQueue taking the clock, first name, sir name, and will set the patient’s illness level. Illness level is based on the randomIllnessLevel function from the RandomsGenerator class following the probability of a patient having a 70% chance of an illness level from 1 to 10, 20% chance of an illness level from 11 to 15 and a 10% chance of an illness level from 16 to 20. The simulator will run through this function until it reaches 10,080 seconds, the time in a week.

Use Cases:

UML Diagram:

Pseudo-code:

* You need to simulate a hospital emergency room located in the town of 273ville, population 2000.
* The names of all the residents of 273ville are stored in our class folder.
* Every person in 273ville is equally healthy, but they do occasionally need to go to the emergency room.
* I.e. there is equal probability that anyone in town will be admitted into the emergency room as a patient.
* Your emergency room is small, but it has a big heart. It tries to run its operation as efficiently as possible.
* When a patient arrives at the emergency room, he/she is triaged – that is, the patient is assigned a priority number from 1 to 20, depending on the severity of the illness. Higher priority values indicate more serious illnesses and are always treated ahead of lower priority illnesses.
* Illnesses with priority 1 to 10 occur approximately 70% of the time with equal probability
* Illnesses with priority 11 to 15 occur approximately 20% of the time with equal probability.
* Illnesses with priority 16 to 20 occur approximately 10% of the time with equal probability.
* The emergency room has 2 categories of caregivers: Doctors and Nurses.
* Nurses can treat patients with priority 1 to 10, and doctors can treat patients with priority 1 to 20. **PRIORITY QUEUES**
* Empirically, we also know that nurses take 1 to 10 minutes to treat a patient, and doctors take 1 to 20 minutes to treat a patient, on average.
* The hospital keeps a record of all patients that were treated in the emergency room. Each record stores:
* the number of visits to the emergency room, and
* the severity of illness on each visit **VECTORS**
* Your simulation needs to examine a week in the life of the emergency room on a minute-by-minute basis (i.e. it needs to simulate at least 7x24x60 minutes).
* Allow the user to input the following data values:

~~The average hourly patient arrival rate (patients/ hour) at the emergency room –assume that there will not be more than 60 patients per hour.~~

~~The number of doctors working in the emergency room.~~

~~The number of nurses working in the emergency room.~~

* You simulation will need to calculate the average visit time (arrival to discharge time) for emergency room patients.
* At the end of the simulation, you will need to display a menu with options to list the names of all residents that were treated, and retrieve the record of a resident by “name”.
* For your final report and presentation:
* Compare and comment on the average patient visit time (for some fixed patient arrival rate) when the emergency room has
* 1 doctor and 1 nurse
* 1 doctor and 2 nurse
* 2 doctors and 1 nurse
* Display a plot of the visit time for increasing patient arrival rates, for a combination of doctors and nurses of your choice