**Emergency Room Simulator**

Requirement Specification:

**Use Cases (User input/Clock ticks):**

User Enters Arrival Rate

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | User enters an integer for the arrival rate per hour of patients. | If invalid integer system prompts for user to try again. |
| 2. |  | System stores the value as the arrival rate per hour |

User Enters Number of Nurses and Doctors

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | User enters an integer for the number of doctors. | If invalid integer system prompts for user to try again. |
| 2. |  | System stores the value as the number of Doctors, and prompts for user to enter the number of nurses. |
| 3. | User enters an integer for the number of nurses. | If invalid integer system prompts for user to try again. |
| 4. |  | System stores the value as the number of Nurses. |

Emergency Room Update

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | Simulator gets a random number and compares it to the arrival rate. | System checks if the number is less than the arrival rate and returns true or false. |
| 2. |  | If the system returns false then update ends. If system returns true system creates a new patient. |
| 3. | Simulator takes the illness level of the patient and checks if it is less than 11. | System returns true if value is less than 11 or false if value is greater than 11. |
| 4. |  | If the system returns true the patient is put into a nurse priority queue, but if false the patient is put into a doctor priority queue. |

Nurse Queue Update

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | Simulator checks if the nurse does not have a patient. | System returns true if there is no patient or false if there is a patient. |
| 2. |  | If true the system checks if the nurse’s priority queue has any patients ready to be treated. If false nothing happens. |
| 3. |  | If system returns true it gives that nurse the top patient from the nurse priority queue. If system returns false nothing occurs. |
| 4. | Simulator checks if the nurse does have a patient. | System returns true if there is a patient or false if there is not a patient. |
| 5. |  | If system returns true then it checks whether the patient is done being treated. |
| 6. |  | If system returns true it removes the patient and if false the system does nothing. |

Doctor Queue Update

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | Simulator checks if the doctor does not have a patient. | System returns true if there is no patient or false if there is a patient. |
| 2. | Simulator checks if there are any patients in the doctor priority queue. | If true the system checks if the doctor’s priority queue has any patients ready to be treated. If false nothing happens. |
| 3. |  | If system returns true it gives that doctor the top patient from the doctor priority queue. If system returns false nothing occurs. |
| 4. | Simulator checks if the doctor does not have a patient again. | System returns true if there is no patient or false if there is a patient. |
| 5. | Simulator checks if there are any patients in the nurse priority queue. | If true the system checks if the nurse’s priority queue has any patients ready to be treated. If false nothing happens. |
| 6. |  | If system returns true it gives that doctor the top patient from the nurse priority queue. If system returns false nothing occurs. |
| 7. | Simulator checks if the doctor does have a patient. | System returns true if there is a patient or false if there is not a patient. |
| 8. |  | If system returns true then it checks whether the patient is done being treated. |
| 9. |  | If system returns true it removes the patient and if false the system does nothing. |

User Displays Treated Patients

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | User issues the command to display all the treated patients. |  |
| 2. |  | System outputs every patient that has been treated that week at the hospital. |

User Searches for a Patient

|  |  |  |
| --- | --- | --- |
| Step | User’s Action | System’s Response |
| 1. | User issues the command to search for a specific patient. |  |
| 2. |  | System prompts for name. |
| 3. | User enters name. | If user cancels entry of name, process terminates. If invalid entry system prompts for user to try again. |
| 4. |  | System outputs all patients with that name and their illness level. |

**UML Diagram:**

|  |
| --- |
| **Simulator/Hospital** |
| - num\_of\_doctors : int  - num\_of\_nurses : int  - total\_time : int  - average\_visit\_time : double  - average\_wait\_time: double  - total\_patients\_served : int  - clock : int  - read\_int () |
| + enter\_data ()  + run\_simulation ()  + end\_data ()  + end\_menu ()  + search (name)  + show\_list () |

|  |
| --- |
| **Nurse** |
| - treatment\_time : int  - service\_time : int  - visit\_time : double  - nurse\_wait\_time : double  - patients served : int |
| + set\_emergency\_queue ()  + get\_num\_of\_patients\_served ()  + get\_treatment\_time ()  + get\_visit\_time ()  + get\_nurse\_wait\_time ()  + update () |

|  |
| --- |
| **Doctor** |
| - treatment\_time : int  - service\_time : int  - visit\_time : double  - doctor\_wait\_time : double  - patients served : int |
| + set\_emergency\_queue ()  + get\_num\_of\_patients\_served ()  + get\_treatment\_time ()  + get\_visit\_time ()  + get\_doctor\_wait\_time ()  + update () |

|  |
| --- |
| **Emergency Room** |
| - arrival\_rate : double  - num\_of\_doctors : int  - num\_of\_nurses : int  - num\_of\_patients : int |
| + set\_patient ()  + set\_arrival\_rate ()  + get\_num\_of\_patients ()  + set\_num\_of\_doctors ()  + set\_num\_of\_nurses ()  + illness\_level ()  + update () |

|  |
| --- |
| **Patient** |
| - arrival\_time : int  - illness\_level : int  - start\_treatment\_time : int  - first\_name : string  - last\_name : string |
| + add\_patients ()  + get\_first\_name ()  + get\_last\_name () |

|  |
| --- |
| **Random** |
| + next\_double ()  + next\_int () |

Pseudo – Code: