**CS273 ASSIGNMENT #7: Queues and Simulation**

## MY NAME:

**Grade:**

|  |  |  |
| --- | --- | --- |
| **CATEGORY** | **POINTS** |  |
| **EX7\_Simulator** |  | 100 |
| **TOTAL** |  | 100 |
| **EXTRA CREDIT** |  | 10 |

### Computer simulations are used in the social sciences, physical sciences, health sciences, engineering, design, and many other areas. Therefore, it is important that we understand how computer simulations work, and how to design them.

### Simple Airport Simulator (EX7\_Simulator)

1. We need a simple airport simulator. It will simulate an airport with one landing strip, one gate, and one take-off strip. Hey this is a small airport!
2. The simulator will simulate the operations of the airport on a minute-by-minute basis.
3. In order to examine different **what-if** scenarios, the simulator will allow users to input the following:
   1. The **average rate at which planes arrive** **per hour** (planes / hour) at the airport.
      1. The **average rate per minute** is derived in the simulator by dividing this by 60.0.
   2. The **range of service times** per plane (min service time, max service time) in minutes.
   3. A **fixed amount of time it takes for a plane to takeoff**.
4. The simulator uses one queue to hold the planes that are waiting to land. We will call this the **landing queue**. A plane is added to the back of the **landing queue** at the average rate per minute specified in 3(a)(i).
5. The simulation can only service (i.e. loading, unloading, fueling, etc.) one plane at a time at the single gate. Make a **service queue** **but, for now, only allow** **ONE** plane at a time in this queue!
6. When the **service queue** does not contain a plane the simulation should move a plane from the front of the **landing queue** to the **service queue**.
7. When a plane is added to the **service queue**, a random service time will be computed for it from the range specified in 3(b). The plane will then remain in the **service queue** for this amount of time.
8. Finally, the simulator will use one queue to hold all the planes that are waiting to take-off**.** We will call thisthe **departure queue**.
9. A plane enters the **departure queue** immediately after it leaves the **service queue**.
10. When a plane arrives at the front of the **departure queue**, the simulation will wait for the amount of time specified in 3(c) before removing the plane from the queue (i.e. the plane takes off).
11. Every minute, the simulation should check the state of each of the queues and update them according to the rules specified.
12. The simulation computes the **average waiting time** for planes in the **landing queue** and the **departure queue**.



**Landing Queue**

**Service Queue**

**Departure Queue**



Now for some good news! We have written much of simulation for you. Great way to spend our Saturday nights!

Your task is to complete the simulator. Copy our project from [our](file:///\\CS1\CS_ClassData\273\AirportSimulator) class folder (AirportSimulator.zip) to your GitHub account

**Complete the parts of the code with the //FIXME comments (there are 13 of these)**. It will be helpful at this time to re-read **section 6.5** of the text book. Have fun!

**(Extra Credit)** ***You can only get extra credit if the main simulation described above is already working successfully.***

For an extra 10 points, modify the simulator so that you can simulate the operations of an airport with more than one gate. The simulator will need to ask the user for the number of gates in your airport. Thus when a plane lands, any of these gates (if available) will be able to service it.