

Assignment in Discrete-Event Simulation
Module: Business Analytics: Quantitative Methods
May 2021

Model and analyze the following situation using a simulation tool (Simmer or something else). In a system, customers arrive with a specific distribution:

- a) with fixed interarrival times of 120 sec;
- b) with interarrival times uniformly distributed between 60 and 180 sec;
- c) with exponentially distributed interarrival times with expected value 120 sec.

Each of the customers first needs to travel to one service station. The distance is 10m and for the speed 0.5 m/s can be assumed. In total, there are three service stations available for customers.

Consider the following two types of assigning service stations to customers:

1. a round robin method (first customer travels to first service station, second customer to second service station, third customer to third service station, fourth customer to the first service station, etc.)
2. the service stations have a common queue and the next customer is served by the service station which becomes first available (or by an arbitrary service station in case of more than one being available). Distinguish the two cases that the common queue is before the way to the stations (2a) or after it, i.e. directly in front of the service stations (2b).

Assume that the service stations require service times, which are uniformly distributed between 300 sec and 400 sec. Further specifications of the system are not given and can be chosen freely.

Analyze all 9 combinations of the above assumptions (i.e., a1, b1, c1, a2a, b2a, c2a, a2b, b2b, and c2b) by simulation runs of about 4 hours.

During the simulations check for situations of congestion and try to answer the following questions:

- How many customers are served on average during an hour at each of the service stations?
- What is the degree of utilization at each of the service stations?
- What is the average length of the queues?
- What is the average throughput time of the customers?

Please provide a written report of your results. You should describe the main modeling concepts as well (e.g., design of the system and used elements) including code and problems observed during modeling and simulation runs (if there were any).

The assignment can be prepared by groups of up to three students.

Length of the report: ca. 4-5 pages

Deadline of the report: June 16, 2021