

Tutorial – Discrete Event Simulation Assignment 1, WS11/12

Submission until **Wed 10-26-2011 8:00am** via Subversion.

Problem 1 Discrete Event Simulation

The objective is a discrete event simulation (DES) of a GI/GI/1- ∞ queuing system. The simulator should be implemented using Java in an object-oriented fashion for the sake of simple extensibility and re-usability of the code. **Note that you will extend the simulator in later assignments during the semester.** Therefore, it is important that you stick to the exercises.

a) Construct a simulation program according to the outline in the lecture and use at least the following classes.

- **CustomerArrival**
Use a constant inter-arrival time of 10 s.
- **ServiceCompletion**
Use a constant service time of (i) 9 s, (ii) 10 s, and (iii) a uniformly distributed service time between [9...11] s.
- **SimulationTermination**
Use a constant simulation time of (1) $T = 10^4$ s and (2) $T = 10^5$ s.
- **EventChain**
Stores events and returns the event with the lowest event time.

Note that you do not need to implement an efficient data structure since Java already provides a large number of classes for efficient data storage (`java.util` package).

The main program holds the system state which is essentially a counter variable `q` that represents the queue occupation. Try to implement the system behaviour according to the process-oriented model given in the lecture. Provide means to measure the minimum and maximum queue occupation.

b) Perform the 3×2 different simulation runs according to the parameters given above. Explain the results observed for the minimum and maximum queue occupation.

c) Classify the simulations (deterministic/stochastic, continuous/discrete).

Hint: The structure of the simulation that was discussed in the last lecture requires minor changes in order to support random service completion times.