5. Exercise
Out  Discussion
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Contact by questions
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Problem 1: Queueing Systems
A tool crib has exponential interarrival and service times and serves a very large group of mechanics. The mean time between arrivals is 4 minutes. It takes 3 minutes on the average for a tool-crib attendant to service a mechanic. An attendant is paid $12 per hour and a mechanic is paid $10 per hour. A mechanic imposes cost while he is in the tool crib.
Would it be advisable to have a second or a third tool-crib attendant?

Problem 2: Queueing Systems
Arrivals to a self-service gasoline pump occur in a Poisson fashion at the rate 12 per hour. Service time has a distribution that averages 4 minutes, with a standard deviation of 1 1/3 minutes.
What is the expected number of vehicles in the system?

Problem 3: Input Modeling
The time required for the transmission of a message (in minutes) is sampled electronically at a communications center. The last 50 values in the sample are as follows.

| 7.936 | 4.612 | 2.407 | 4.278 | 5.132 |
| 4.599 | 5.224 | 2.003 | 1.857 | 2.696 |
| 5.259 | 7.563 | 3.937 | 6.908 | 5.002 |
| 8.761 | 4.502 | 6.188 | 2.566 | 5.515 |
| 3.785 | 3.742 | 4.682 | 4.346 | 5.359 |
| 3.535 | 5.061 | 4.629 | 5.298 | 6.492 |
| 3.502 | 4.266 | 3.129 | 1.298 | 3.454 |
| 5.289 | 6.805 | 3.827 | 3.912 | 2.969 |
| 4.646 | 5.963 | 3.829 | 4.402 | 4.924 |

a) How are the transmission times distributed?
b) Develop and test an appropriate model.

Problem 4: Input Modeling
The time (in minutes) between requests to a webserver was recorded with the following last 50 requests.
How are the times between requests for service distributed? Develop and test a suitable model.

**Problem 5: OMNeT++**

Go to the web page of the Tic-Toc-Tutorial\(^1\). Exercise the tutorial up to “5. Visualizing the results with the OMNeT++ IDE”.

**Problem 6: Simulation models, reading**

Download the paper >Internet Research Needs Better Models< by Sally Floyd and Eddie Kohler from the website of the class.

Discuss the paper and the findings of the authors. What are their main findings?

\(^1\)http://www.omnetpp.org/doc/omnetpp/tictoc-tutorial/