5. Exercise

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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
6.212	2.759	7.172	6.513	3.326
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.

0.661	4.910	8.989	12.801	20.249
5.124	15.033	58.091	1.543	3.624
13.509	5.745	0.651	0.965	62.146
15.512	2.758	17.602	6.675	11.209
2.731	6.892	16.713	5.692	6.636
2.420	2.984	10.613	3.827	10.244
6.255	27.969	12.107	4.636	7.093
6.892	13.243	12.711	3.411	7.897
12.413	2.169	0.921	1.900	0.315
4.370	0.377	9.063	1.875	0.790

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/`