Simulation laboratory 3: Statistical analysis and Bootstrapping

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Overview

Objective:

- Analyze the results of discrete events simulation
- Evaluate the maximum-queue-length on a single road

Implementation:

1. Recursive sample mean and sample variance
2. Stopping criteria
3. Bootstrap Mean Square Error of the indexes

1 Statistical analysis

2 Bootstrapping

3 My results

Statistical analysis

Codes:

1. **UpdateStatistics.m**: to code a function for sample mean and sample variance
2. **StatAnalysisAndBootstrapTest.m**: to test the function

Statistical analysis

TODO:

1. Code a function for recursive calculation of sample mean and sample variance in **UpdateStatistics.m**.
2. Apply your stopping criteria in **StatAnalysisAndBootstrapTest.m** (empirical consideration: choose a precision that give you around 100 runs).
3. Test your code and statistically analyze the maximum-queue length of the developed **QueueingSimulation**.

Note:

- Please uncomment the bootstrap part at this moment.

1 Statistical analysis

2 Bootstrapping

3 My results

Bootstrap mean square error

Calculate bootstrap MSE of parameter θ, e.g.:

- **Mean** of the maximum-queue-length
- **95 percentile** of the maximum-queue-length
- **Worst case** of the maximum-queue-length

Bootstrap mean square error

Codes:

1. **BootstrapMSE.m**: to code a function which returns the bootstrap MSE.
2. **StatAnalysisAndBootstrapTest.m**: to test the function (same as the previous one).

TODO:

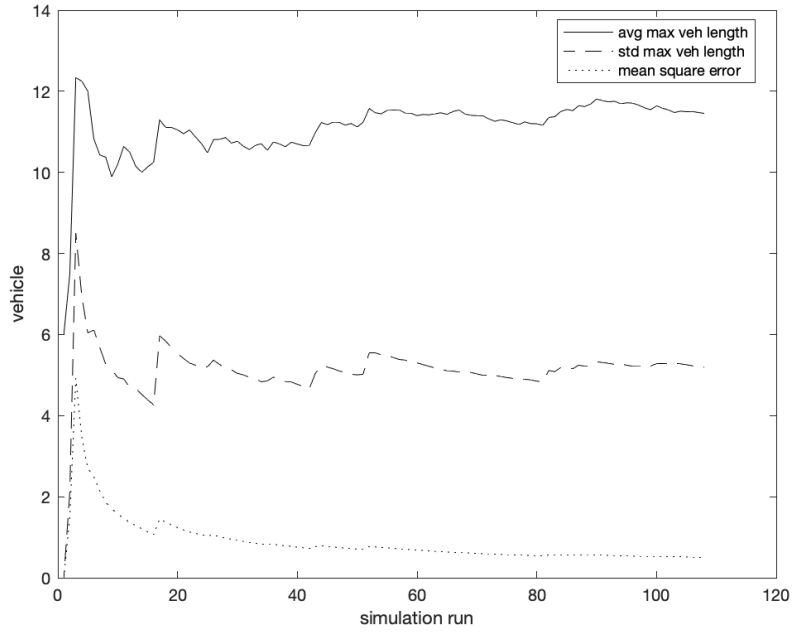
- Code a function in **BootstrapMSE.m** to calculate the bootstrap MSE of parameters of the maximum-queue-length of **QueueingSimulation**.
- Test your code by using **StatAnalysisAndBootstrapTest.m**.

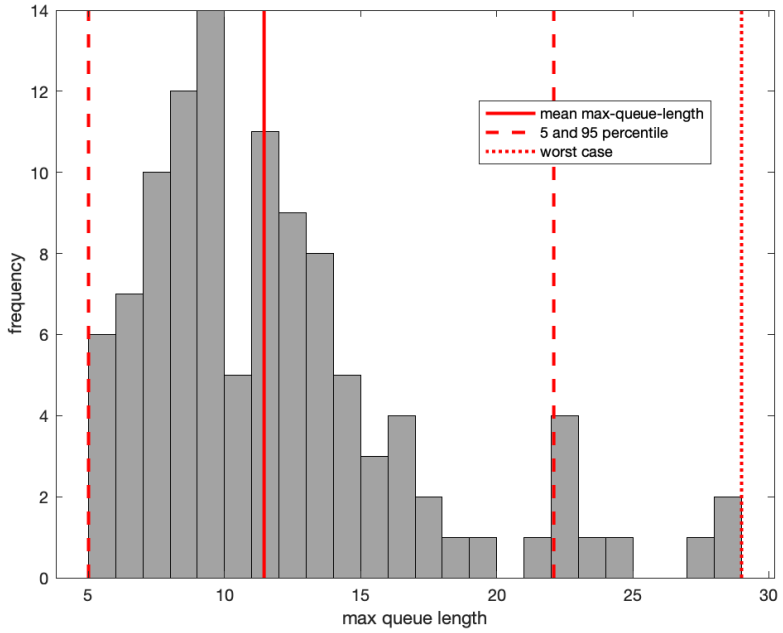
1 Statistical analysis

2 Bootstrapping

3 My results

Statistical indexes

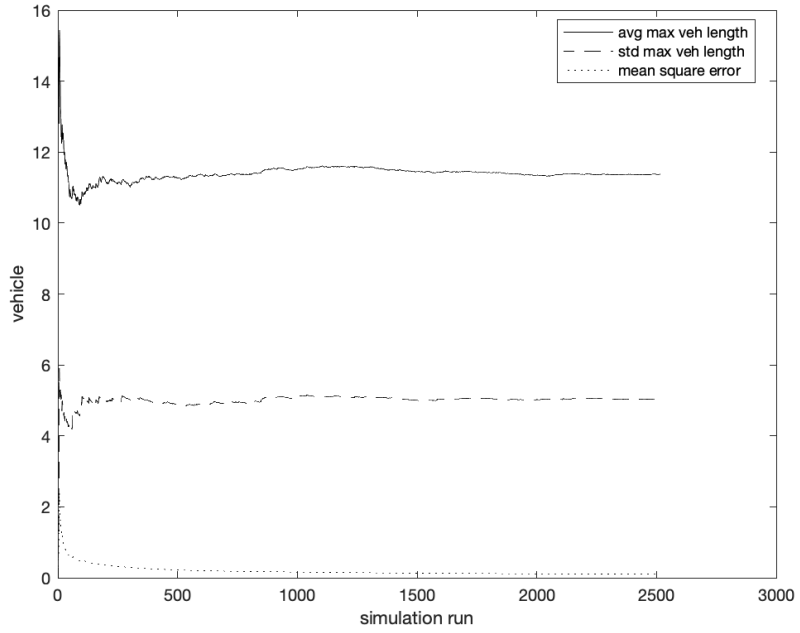


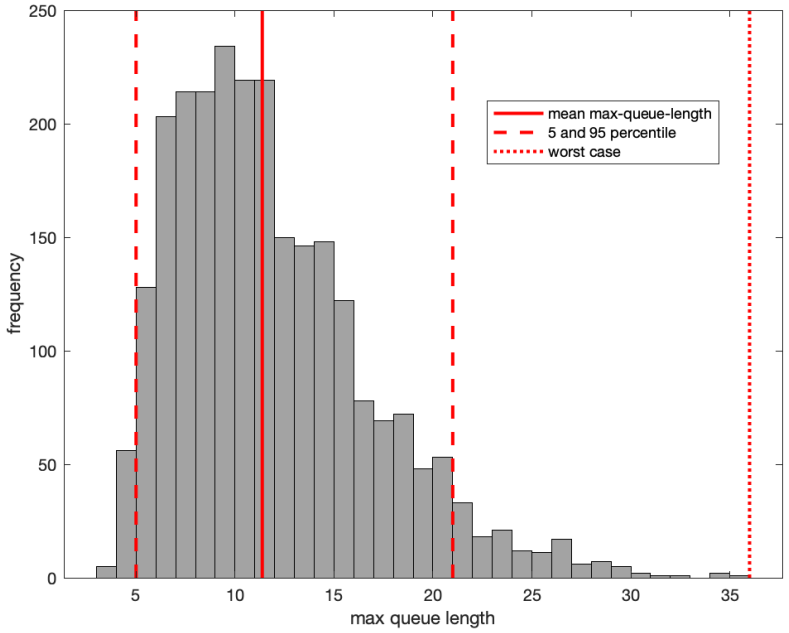


Statistics of max-queue-length (stops when $\sigma/\sqrt{n} < 0.5$):

- Mean = 11.454 (MSE = 0.250, BootstrapMSE = 0.279)
- 95 percentile = 22.100 (BootstrapMSE = 3.061)
- Worst = 29 (BootstrapMSE = 2.100)

Statistical indexes





Statistics of max-queue-length (stops when $\sigma/\sqrt{n} < 0.1$):

- Mean = 11.375 (MSE = 0.010, BootstrapMSE = 0.010)
- 95 percentile = 21.000 (BootstrapMSE = 0.151)
- Worst = 36 (BootstrapMSE = 1.400)