Report

Comp 9334 Project
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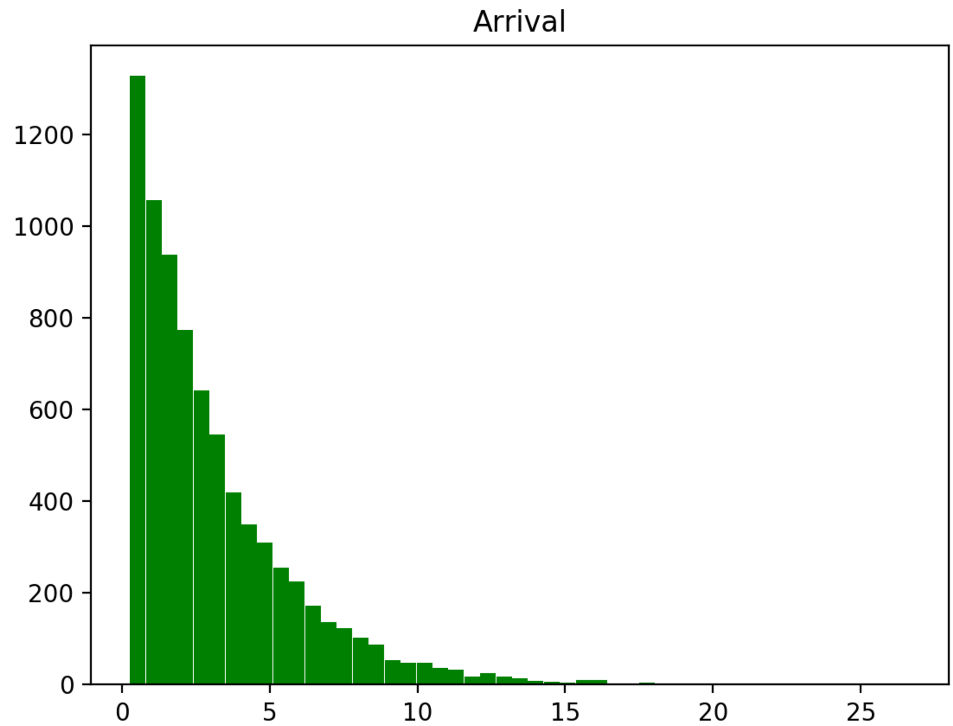
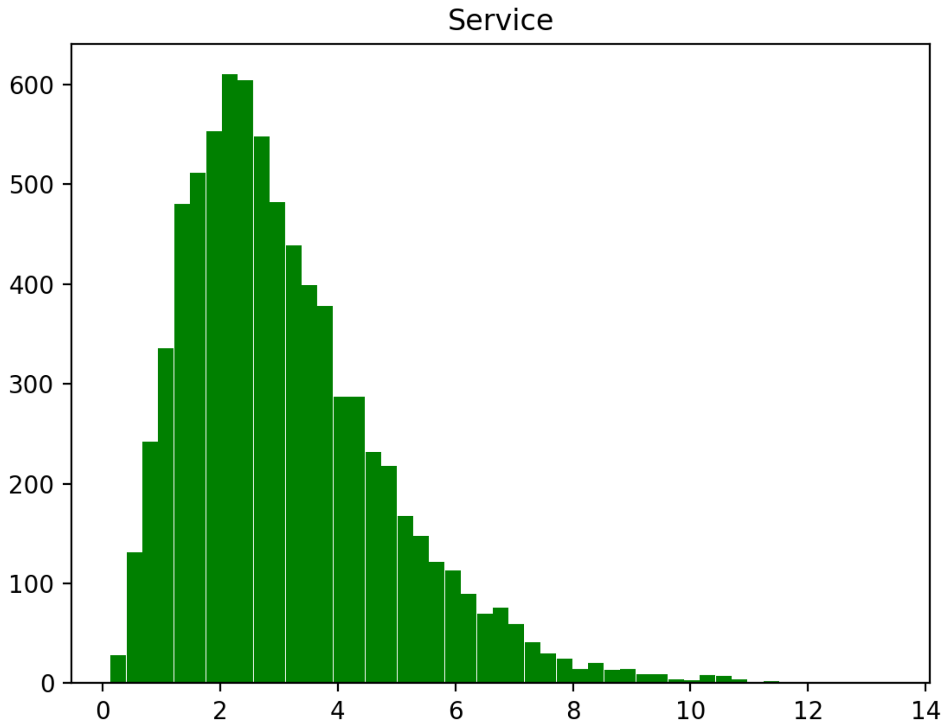
1. Inter- arrival and service time probability distribution

For inter-arrival probability distribution, the bar chart I plot when $\lambda=0.35$ is as follows:



For service time probability distribution, the bar chart I plot when $\mu = 1$ is as follows:



2. Simulation code

From the section 3.2, the arrival and service time are (10,1) (20,2) (32,3) (33,4), number of server is 3, setup time is 50, and Tc is 100.

For this condition, In my simulation, just execute

Mrt, depart

=function(‘trace’ ,list_arrival,list_service_time,3,50,100)

And the answer for this condition are as follows:

mrt = 41.25

job arrive at 10, job departure at 61

job arrive at 20, job departure at 63

job arrive at 32, job departure at 66

job arrive at 33, job departure at 70

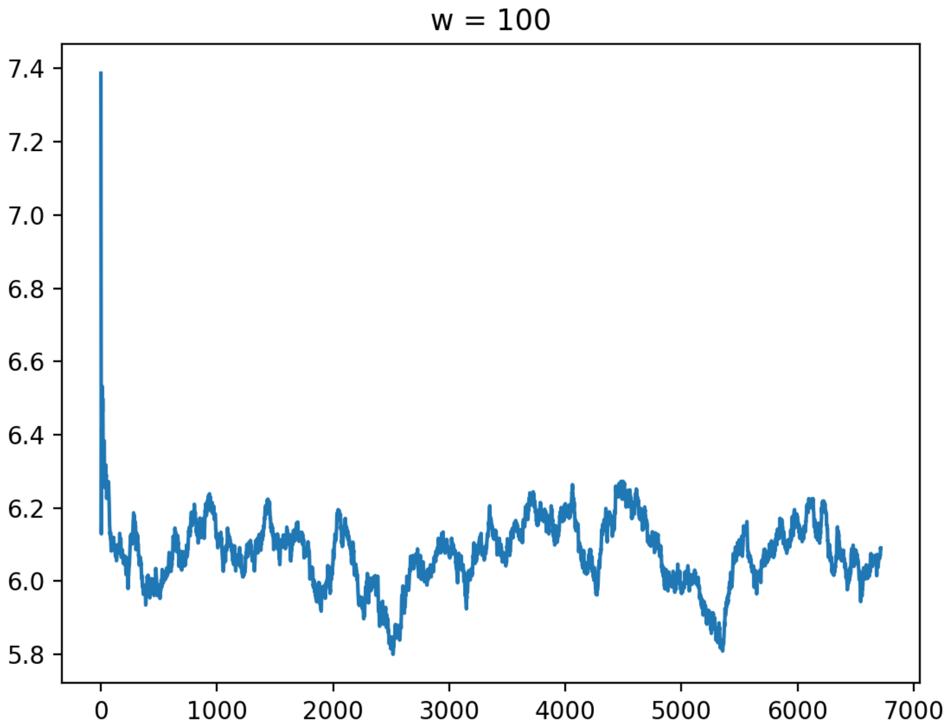
Compare the answer with the table gived in section 3.2, my simulation function is correct.

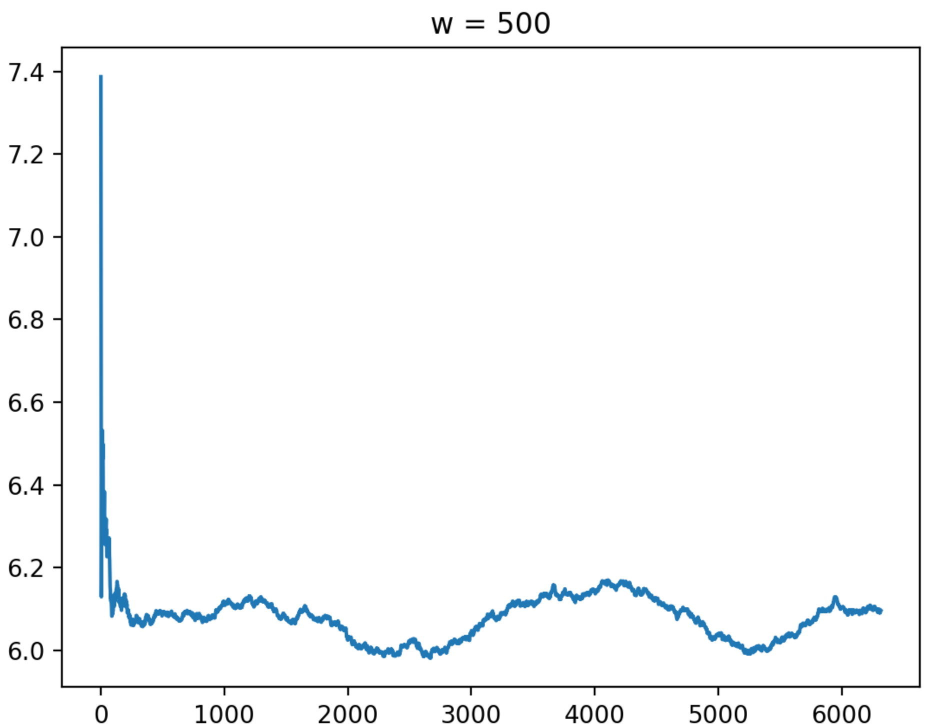
3. Reproducible

Using the sample input: `function('random',0.35,1,5,5,0.1,20000)` three times with different seed 1,2,3. I get three different mrt,6.082,6.083,6.077 respectively.
In order to prove the answers which are correct. I use the statistically sound methods to analyze simulation results. In attached file, the python file 'used_for_report', you can find the code. Using this method, first I make the transient remove. After I compare the different result for different w, I found when w = 2000, the curve is smooth enough, so I remove the first 2000 points to get the mrt. And then use the method to get the 95% probably mrt when tc = 0.1 which is (6.054519338058808, 6.08043401639543). So my answer is correct and reproducible

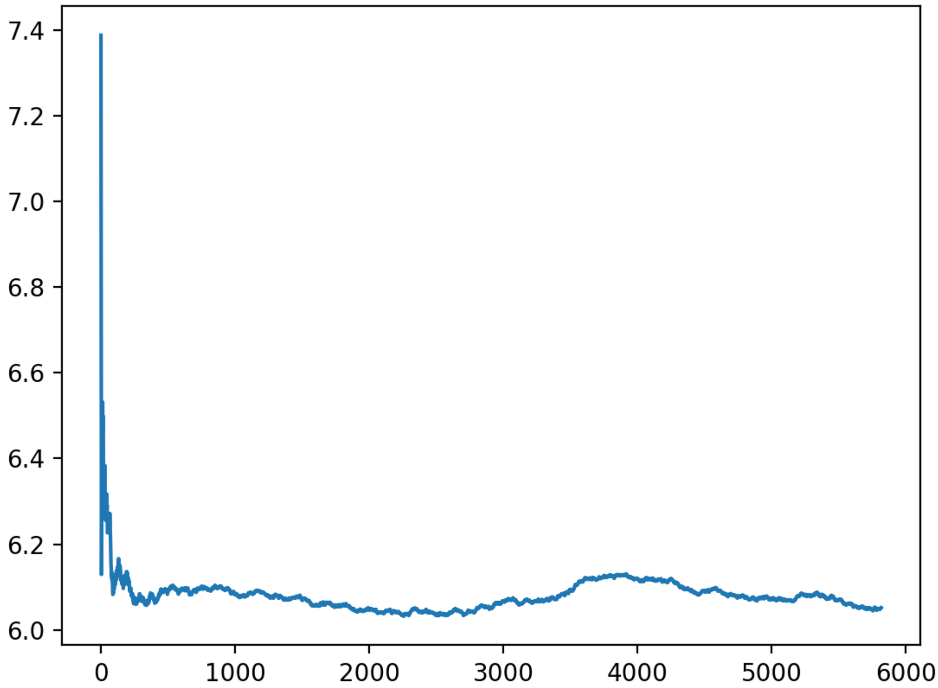
4. Find suitable value of Tc

For finding suitable value of Tc:
First, I use the `function('random',0.35,1,5,5,tc,20000)` when tc start from 0.1. when mrt is lower than the mrt when tc equal to 0.1. I found the tc is 9.4. Then I know the exact mrt is larger than 9.4
Second, I need to make transient removal. i used the different w. the comparison are as follows:


w = 100
7.4
7.2
7.0
6.8
6.6
6.4
6.2
6.0
5.8
0
1000
2000
3000
4000
5000
6000
7000

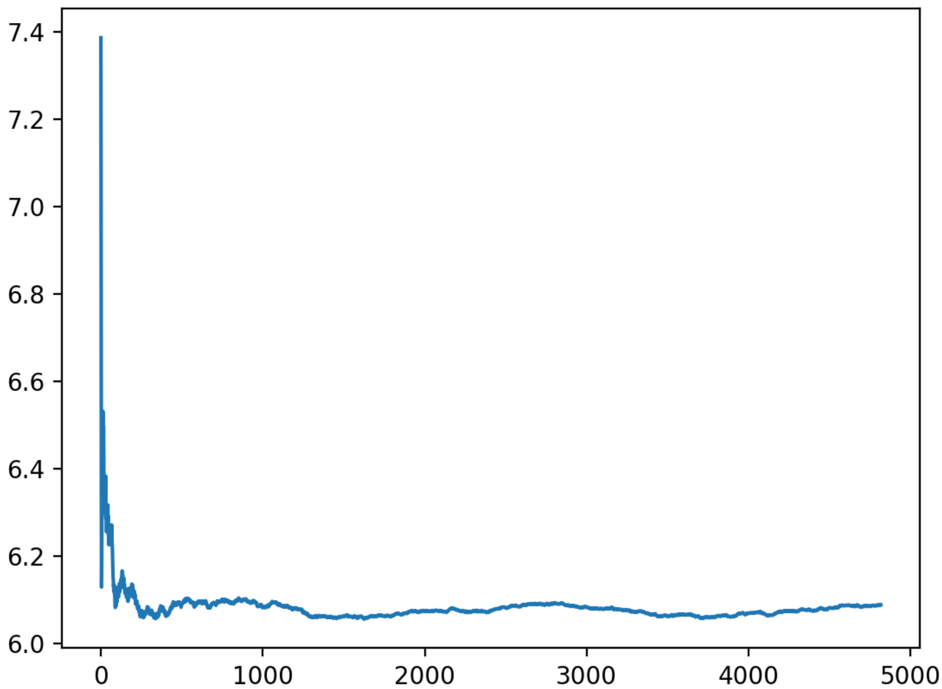

w = 500
7.4
7.2
7.0
6.8
6.6
6.4
6.2
6.0
0
1000
2000
3000
4000
5000
6000

w = 1000



7.4
7.2
7.0
6.8
6.6
6.4
6.2
6.0
0
1000
2000
3000
4000
5000
6000

w = 2000



7.4
7.2
7.0
6.8
6.6
6.4
6.2
6.0
0
1000
2000
3000
4000
5000

Comparing with these different w, I found when w = 2000, the curve is smooth enough. So I remove the first 2000 points to make transient removal.
Third, I choose 30 as my number of replication, use the calculation function in the python file. You will get the 95% probably period for mrt. From the first step, we know the exact tc is larger than 9.5.
When tc =0.1, the period for mrt is (6.054519338058808, 6.08043401639543)
So I just start from 9.6. the answer for process for this action are:
9.5: (4.074234630303644, 4.1013443758990205)
9.6: (4.06717358042997, 4.093217596674605)
9.7: (4.059948545388314, 4.086418619260552)
9.8: (4.0505993359720405, 4.0767695885646456)
9.9: (4.042581669565536, 4.067609770239587)
So, Compare the results with the result when tc equal to 0.1, we know when tc is larger than 9.8, the mrt is two unit less than the sample mrt.