Scheduling Simulator Process Generator

1. Overview

The simulator runs pseudo-processes that have specified alternating **CPU and IO bursts**. You can create specifications for these pseudo-processes using the ProcessGenerator program, in the '`processgenerator`' package.

ProcessGenerator asks for a number of parameters, including the name of the process that is to be generated. It writes the process to file ('`testone.prg`' in the example) and simultaneously prints it on the screen.

A '`make generator`' compiles the program to the '`bin`' directory, and (assuming the simulator framework has also been compiled – with a '`make framework`') the following command executes it:

```
java -ea -cp bin processgenerator.ProcessGenerator
```

Here is an example of its use:

```
CPU Bounds (lambda, min burst, max burst): 8, 1000, 5000
IO Bounds (lambda, min burst, max burst): 5, 2000, 10000
Device identifiers (<integer>, ..., <integer>): 1, 2, 3
Length (number of instructions - must be odd number): 11
Program name: testone.prg

# Program name: testone.prg
# CPU Generator (lambda=8.0, lower_bound=1000, upper_bound=5000)
# IO (lambda=5.0, lower_bound=2000, upper_bound=10000, devices=[1,
2, 3])
CPU 1048
IO 2794 3
CPU 1270
IO 2873 3
CPU 1362
IO 2033 3
CPU 3355
IO 8561 1
CPU 1108
IO 2517 2
CPU 1115
```

2. CPU/IO burst Probability distributions

Chapter 5 CPU Scheduling of the course textbook (Operating Systems Concepts 10th edition) notes that the durations of CPU bursts tend to have an exponential or hyper-exponential frequency curve. You can generate pseudo-processes with this type of curve using the ProcessGenerator program, as follows.

The program asks for two sets of 'bounds' on the instructions it generates, one for CPU instructions, and the other for I/O instructions. These values define the maximum and minimum of the burst

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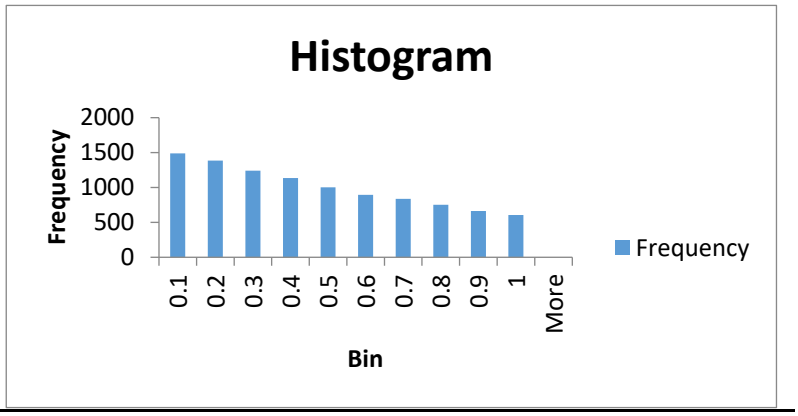
length (or duration) and the probability distribution for the values within this range. The 'lamba' parameter defines the shape of the probability curve.

ProcessGenerator uses a random number generator with an exponential probability distribution. It generates values in the range [0, 1], with values closer to 0 having an exponentially higher probability of occurring.

Graphs of the frequency distribution for values of lambda between 1 and 9 are shown below. Notice that higher values generate a curve closer to the graph for actual CPU bursts in the textbook.

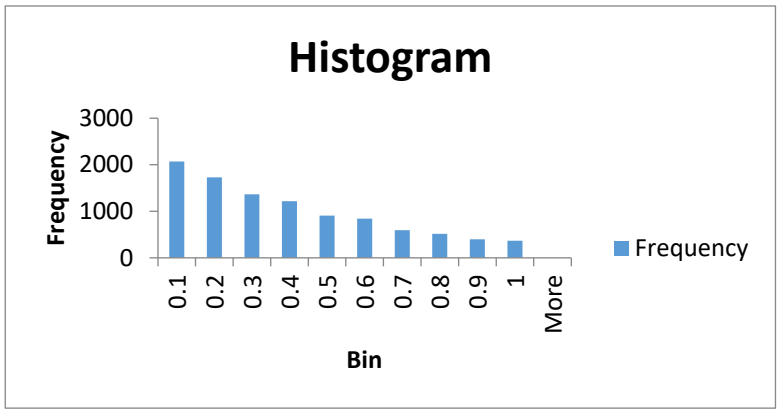
2.1 Lamba = 1

Bin	*Frequency*
0.1	1488
0.2	1384
0.3	1241
0.4	1134
0.5	1002
0.6	894
0.7	837
0.8	753
0.9	662
1	605
More	0



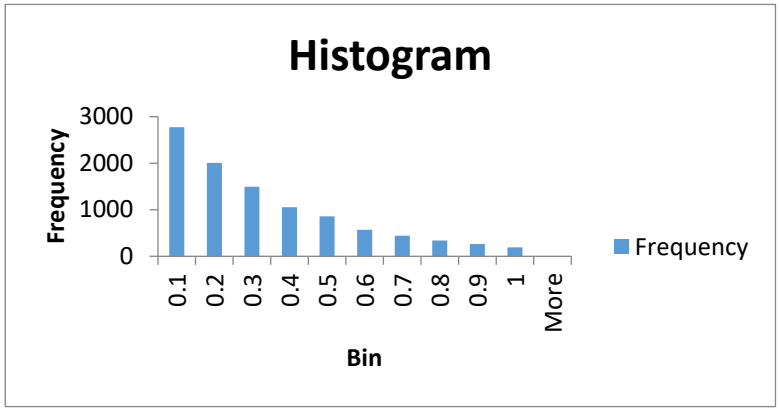
2.2 Lambda = 2

Bin	*Frequency*
0.1	2070
0.2	1728
0.3	1365
0.4	1217
0.5	906
0.6	841
0.7	593
0.8	515
0.9	398
1	367
More	0



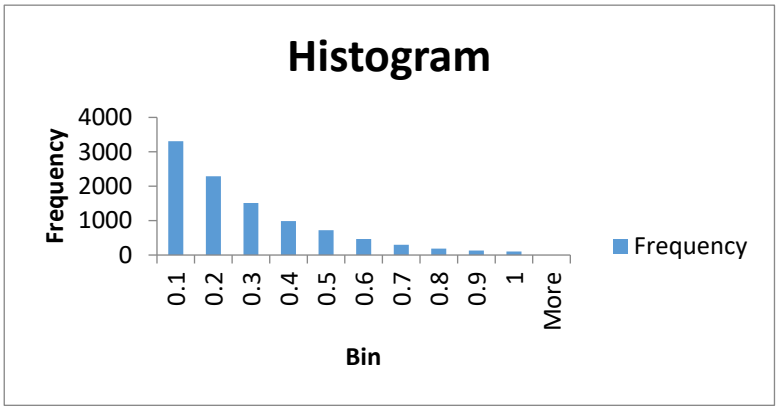
2.3 Lambda = 3

Bin	*Frequency*
0.1	2775
0.2	2007
0.3	1495
0.4	1055
0.5	859
0.6	569
0.7	442
0.8	340
0.9	265
1	193
More	0



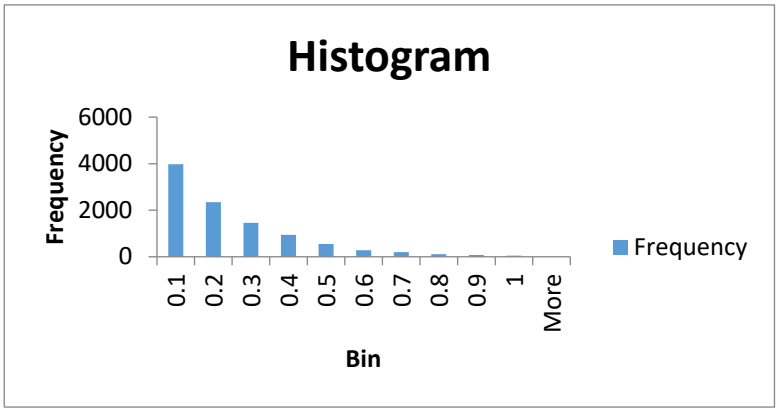
2.4 Lambda = 4

Bin	*Frequency*
0.1	3307
0.2	2290
0.3	1511
0.4	985
0.5	720
0.6	465
0.7	299
0.8	186
0.9	133
1	104
More	0



2.5 Lambda = 5

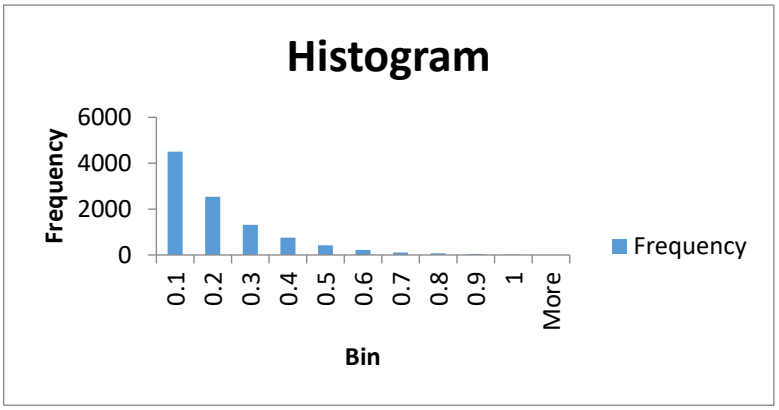
Bin	*Frequency*
0.1	3980
0.2	2345
0.3	1459
0.4	942
0.5	549
0.6	286
0.7	199
0.8	112
0.9	77
1	51



More	0

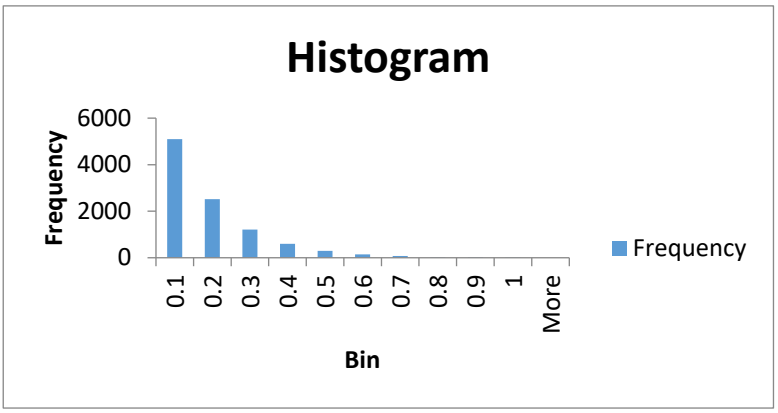
2.6 Lambda = 6

Bin	*Frequency*
0.1	4506
0.2	2535
0.3	1316
0.4	760
0.5	422
0.6	217
0.7	105
0.8	73
0.9	42
1	24
More	0



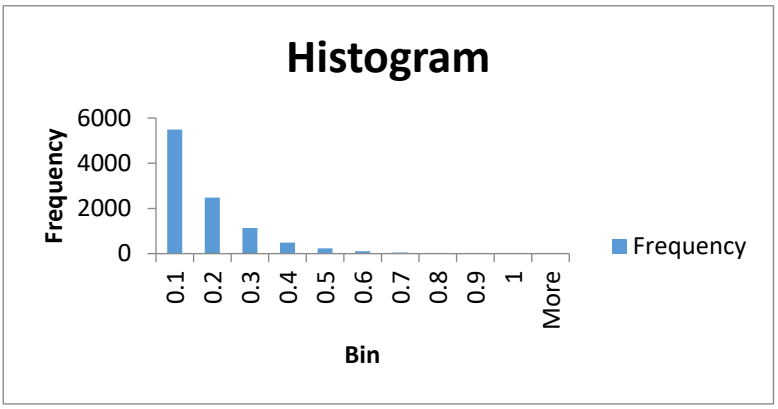
2.7 Lambda = 7

Bin	*Frequency*
0.1	5098
0.2	2518
0.3	1208
0.4	598
0.5	299
0.6	145
0.7	76
0.8	23
0.9	21
1	14
More	0



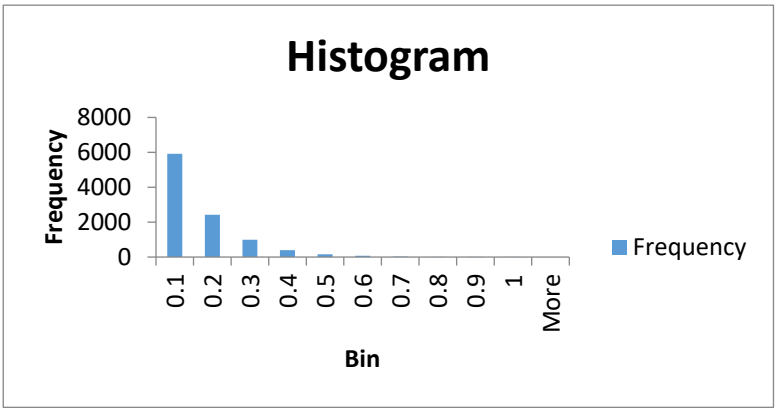
2.8 Lambda = 8

Bin	*Frequency*
0.1	5487
0.2	2481
0.3	1131
0.4	485
0.5	232
0.6	104
0.7	47
0.8	20
0.9	9
1	4
More	0



2.9 Lambda = 9

Bin	*Frequency*
0.1	5917
0.2	2419
0.3	994
0.4	397
0.5	157
0.6	74
0.7	28
0.8	8
0.9	4
1	2
More	0



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