Faculty of Engineering of the
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Telecommunication Systems

Discrete event traffic simulation: Part1

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1 Simulation of a Poisson arrival process

In this exercise, we simulated a traffic source that generates calls with a given rate of lambda according to a Poisson process. For this exercise, we created a new library with extra functions (you can check them in the library at *func.h*). Also we took advantage of the library provided (*Lista_ligada.h*). Also, we took in consideration the recommended number of bins to the histogram as 25.

1.1 Line a)

You will be able to visualize tje output from running the simulation, and its histogram below.

```
faria45@faria45-ThinkPad-X240:~/Desktop/STE
*** Simulation starting ***!
Simulation by 100000 samples!
Theoretical value of lambda: 5.000000
Estimator of lambda = 4.995767
Number of calls simulated: 100000
Last Call received: 20016.945312
Avarage interval between calls: 0.200169
Init the confi of file histogram1.csv
```

Figure 1: Output of the first program, with the number of samples and the lambda as input

As you can see that the estimator for the average of the interval between consecutive calls is nearly close to 1/lambda. In our case, we assumed lambda as 5 calls/second which it's theoretically predicted to be 0.2 for the delta value.

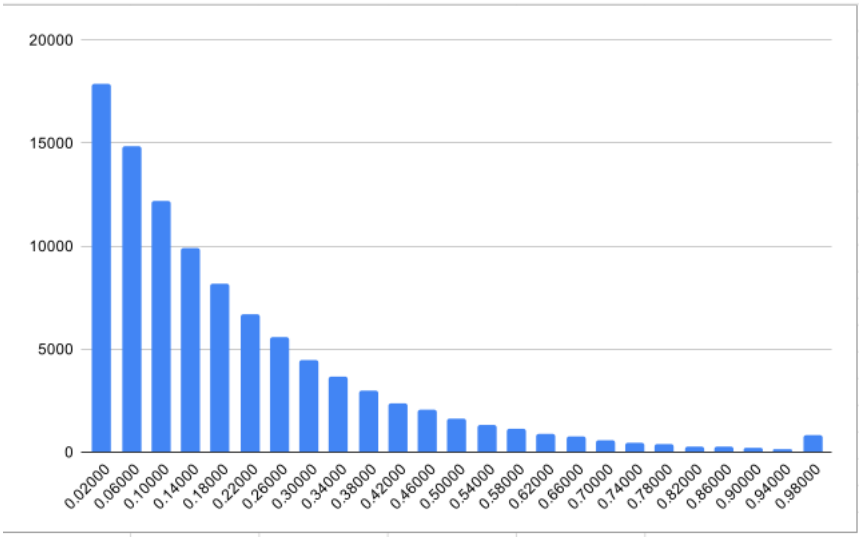

Figure 2: Histogram representing the interval between consecutive arriving calls

1.2 Line b)

You will be able to visualize the output from running the second simulation, and its histogram below. For this part of the assignment, we assumed our

delta value as 1/(lambda*1000), which allows us to have an infinitesimal value. e took in consideration the definition of a Poisson process, giving it's event probability as the problem suggests.

```
*** Simulation starting ***!
Simulation by 100000000 samples!
Theoretical value of lambda: 5.000000
Estimator of lambda = 5.019213
Number of calls simulated: 100384
Last Call received: 19999.947266
Avarage interval between calls: 0.199234
Init the confi of file histogram2.csv
```

Figure 3: Output of the second program, with the number of samples and the lambda as input

This simulation is different from the previous one, because not all the samples are simulated, due to the intervals that we defined with the delta assigned, and also due to the "probability" aspect in the Poisson process. In any case, that didn't affected our estimator for the value of the interval between calls, and we can observe that even though there is a lower number of calls simulated, the value is pretty close to the theoretically one of 0.2. We can also observe that the histogram is very close to the exponential one, which allows us to conclude that it's basically the same process than before.

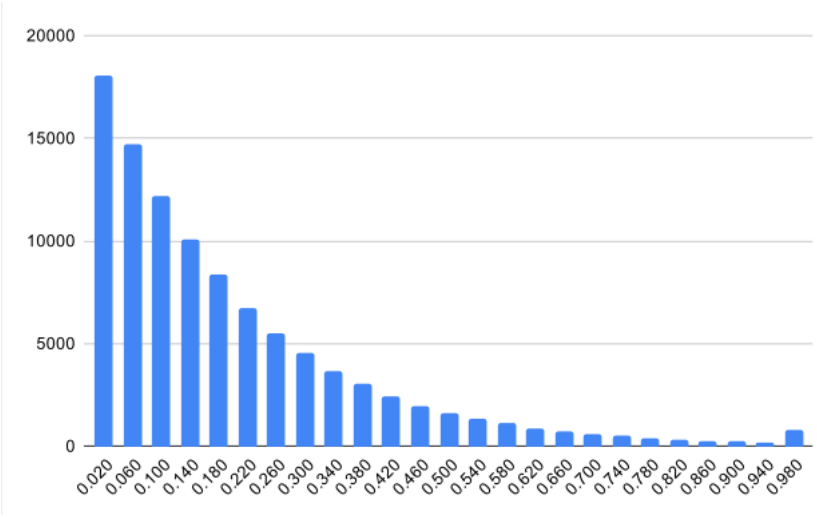

Figure 4: Histogram representing the interval between consecutive events that occurred in the simulation