
Lab Number : 11

Due Date : Nov 25, 2020

Student Details :

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Explanation:

For this assignment we have first used the mixed LCG (linear congruence generator), with the seed $x_0 = 111$, and the equation being,

$$x(i+1) = (1229x(i) + 11) \% 2048$$

$$u(i+1) = x(i+1)/2048$$

We generate the first full period sequence for the LCG, which is why we use $m=2048$. The point set $\{x_1, x_2, x_3, \dots, x_{2047}\}$ is generated (with the value of $n=m=2048$), using the LCG. The discrepancy is calculated for each of the N subintervals A in the interval \mathcal{A} , by finding the number of x_i s in a range of length $1/N$. The following formula is then applied:

$$Discrepancy = \sup A \in \mathcal{A} \left| \frac{\#\{x \in A\}}{2048} - \frac{1}{N} \right|$$

Results:

We don't need any specific libraries for this assignment.

The following values were obtained:

The value of N	Discrepancy
10	0.000391
20	0.000293
50	0.000469
100	0.000254

Note that the values of discrepancy have been rounded to 6 digits after decimal point.

Inference:

- The discrepancy in each case is very low, of the order of 10^{-4} . This implies that the pseudo random uniform distribution obtained with the help of the LCG is very close to being perfectly uniform.
- Also, the value of the discrepancy is low, even at higher values of N, which signifies the granularity of the distribution.