MA323(Lab-12)

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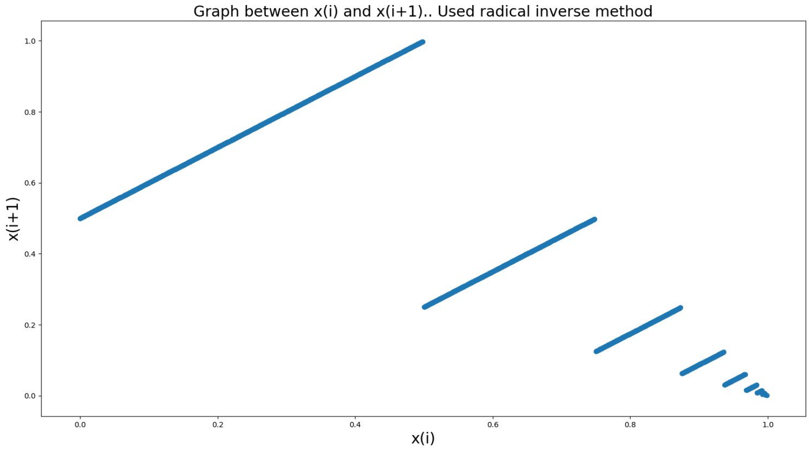
Mathematics and Computing

Problem 01

First of all, first 25 values of the Van der Corput Sequence, using the radical inverse function were generated and values are shown on right side:

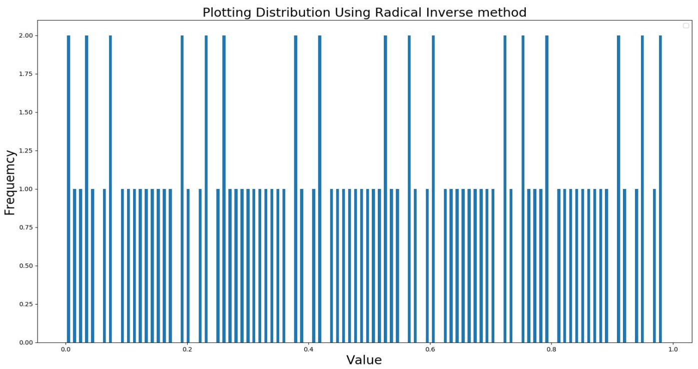
Then, 1000 values of this Van der Corput Sequence were generated and corresponding Graph is plotted in 2D:

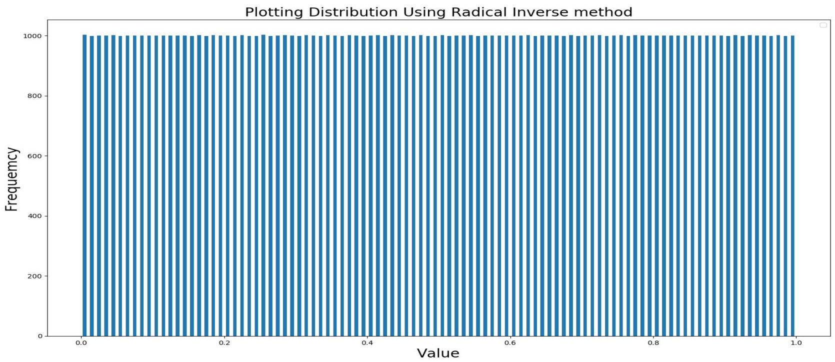


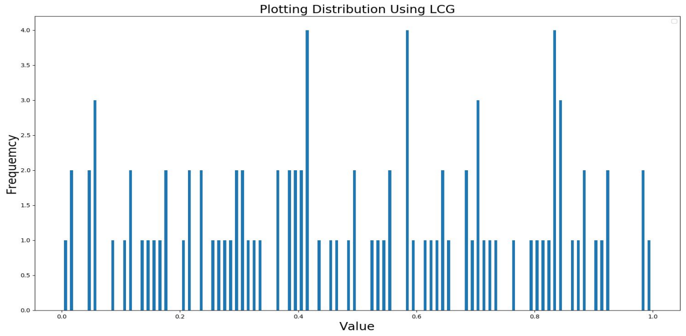
Observations: All 1000 x(i) generated using radical inverse function were in [0, 1)
And similar type of graph was generated in Lab01 where we use LCG.
This means sequence generated somewhat follow U[0, 1] distribution.
Corresponding Distribution graphs on next page makes it clear.

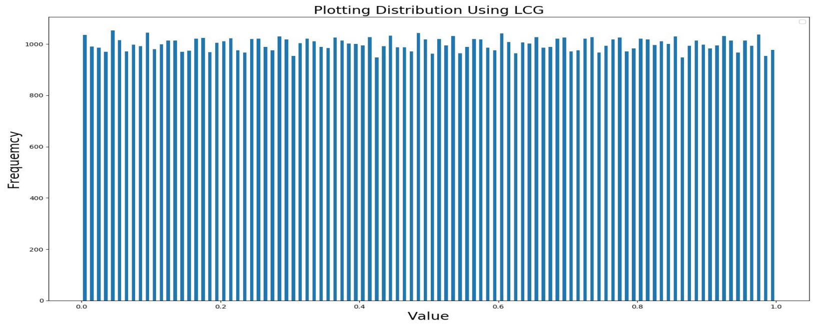
i	φ2(i)
0	0.000000
1	0.500000
2	0.250000
3	0.750000
4	0.125000
5	0.625000
6	0.375000
7	0.875000
8	0.062500
9	0.562500
10	0.312500
11	0.812500
12	0.187500
13	0.687500
14	0.437500
15	0.937500
16	0.031250
17	0.531250
18	0.281250
19	0.781250
20	0.156250
21	0.656250
22	0.406250
23	0.906250
24	0.093750

Then 100 and 100,000 values were generated from Van der Corput sequence and LCG(a= 1597, b= 51749, m= 244944).
It is observed that as we increase numbers in sequence, distribution of numbers generated from Van der Corput sequence approaches to distribution of numbers generated from LCG, which basically means sequence is uniformally distributed between 0 and 1.
LCG used is specified above. Reason to use this LCG is to have full period(i.e. m-1).
Following graphs makes it more clear.





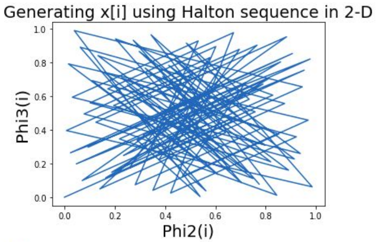




Problem 02

For this part, 100 and 100,000 values were generated which is known as the Halton sequence $x_i := (\varphi_2(i), \varphi_3(i))$.
As 2 and 3 are relatively prime, it is observed that points generated are uniformally distributed in [0, 1) X [0, 1).
Corresponding graphs are shown on right side:

100



100000