A Equiprobability

A1

1. The “condition_hit” becomes true when there’s a disk centers in each of the small red boxes.

   The max operation means that if a is in the small red box represented by b. If max(·) is smaller than delta, then it is in the box. The min operation means that there should only be 1 disk centers in the red box.

   The “if condition_hit” statement checks if the output configuration hits the configuration a, b or c.

2. Sigma = 0.15, delta = 0.05

   n_runs = 10^4

	Trial 1	Trial 2	Trial 3
Hit_a	0	0	0
Hit_b	1	1	2
Hit_c	1	2	1

   n_runs = 10^5

	Trial 1	Trial 2	Trial 3
Hit_a	17	12	10
Hit_b	12	9	11
Hit_c	11	8	8

   n_runs = 10^6

	Trial 1	Trial 2	Trial 3
Hit_a	135	106	113
Hit_b	124	114	115
Hit_c	115	126	112

   The larger n_runs is, the probability of a, b and c are closer.

3. Sigma = 0.15, delta = 0.1.

   n_runs = 10^4

	Trial 1	Trial 2	Trial 3
Hit_a	168	195	203
Hit_b	96	96	98
Hit_c	95	113	95

   n_runs = 10^5

	Trial 1	Trial 2	Trial 3
Hit_a	1898	1884	1877
Hit_b	954	888	960

Hit_c	985	969	956

n_runs = 10^6

	Trial 1	Trial 2	Trial 3
Hit_a	18736	18966	19005
Hit_b	9075	9123	9287
Hit_c	9850	9941	10190

There are two facts when we enlarge del_xy from 0.05 to 0.10:

1) All the hits increases. This is quite reasonable since we enlarged the area of the red box. It is more likely to hit these boxes.
2) The probability of the three configurations are not the same any more. The probability of configuration a is roughly twice that of b or c. The probability of configuration b is a bit smaller than that of c. This is because when we enlarge the red box, some area of the red box is not a legal position for a disk. This will certainly decrease the probability.

4. It is like a uniform sampling in the configuration space. However, some places in the configuration space is illegal. So after a uniform sampling in the whole configuration space, the sample should be denied if it is illegal. This makes it a uniform sampling in the legal part of the configuration space.