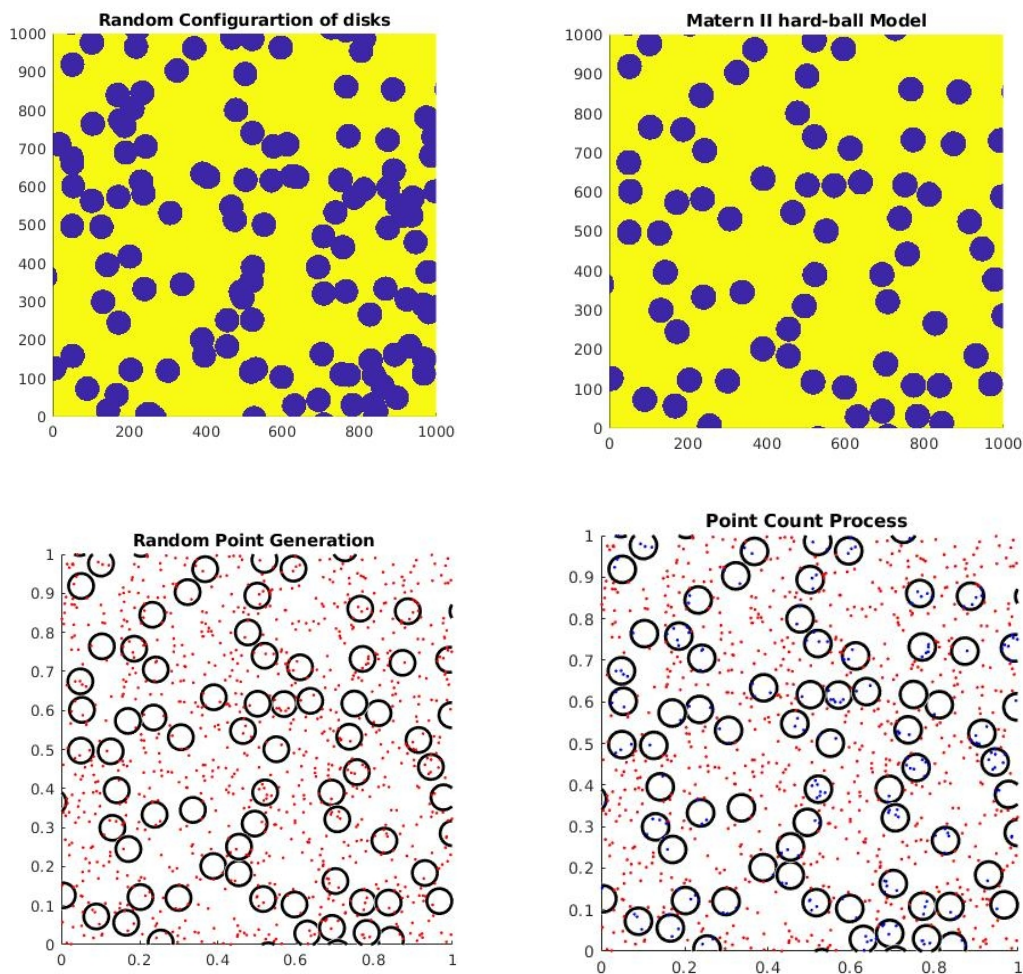


To execute the task, '**main_61492.m**' file has to be run. To choose tasks *a*, *b* and *c*, modify the variable 'choice' to 1, 2 and 3 respectively.

Task 1:

A function **rMaternIIDisc** which generates a random configuration of discs of some deterministic radius $R > 0$ according to the Matérn II hard-ball model for dimension $d = 2$ is created, which takes intensity '*lambda*' window-size '*W*' and disc radius, '*R*' as input.

The function initially generates random discs based on the intensity from which the intersecting discs are removed, by deleting the 'newer' disc between an intersection.



Task 2:

A function **estAA** which estimates the area fraction of a union of discs using the point count method is created, using the points of a realization of a homogeneous Poisson point process of some intensity ' μ ' in the window '*W*'.

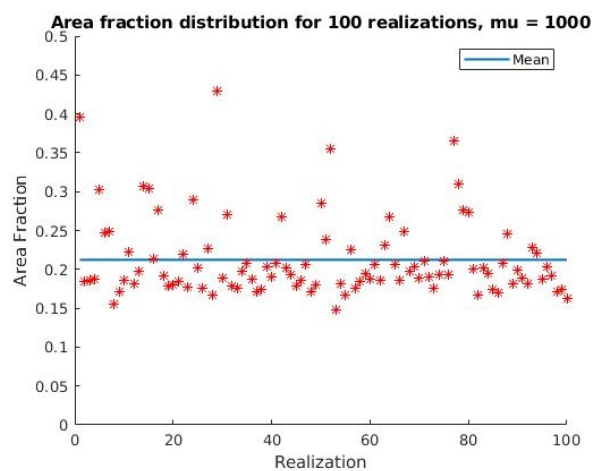
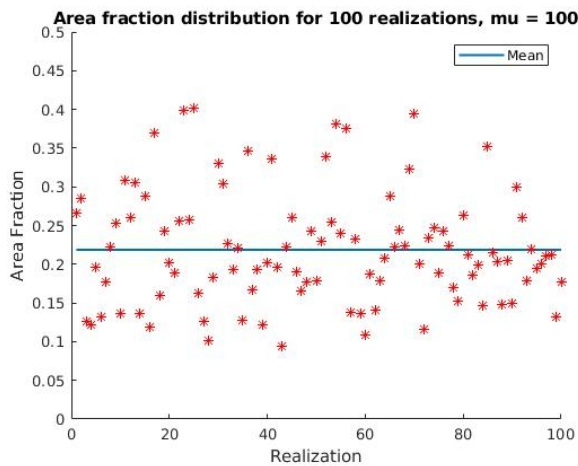
From Point count method, the points inside the discs are divided by the total number of random points generated, to estimate the *area fraction*.

Task3:

100 realizations of the Matérn II hard-disc model with $\lambda = 110$ and $R = 0.032$ in a quadratic window W of side length $s = 1$ for the choice $\mu=100$ and $\mu=1000$. The empirical mean and the empirical variance for the 100 estimated area fractions are calculated.

The following values are obtained for $\mu=100$ and $\mu=1000$:

μ	100	1000
Empirical mean	0.212472	0.211848
Empirical Variance	0.004709	0.003080

**Observations:**

The configuration of discs in the window is almost 25% of the total space. Increasing the intensity ' μ ', decreases the variance (the generated area fractions tend to be closer to the mean value)