

Fractal Dimension of 2D Diffusion Limited Aggregates

Read Section 16.4.1 carefully and determine the fractal dimension of the two-dimensional diffusion limited aggregates (DLA). You can find the answer in Internet. However, you have to find it by yourself using Monte Carlo simulation. You may use the MATLAB code given in the lecture note. The simulation might take a long time depending on the power of your computer.

1. Generates a DLA with at least 40000 particles.
2. Consider a circle of $R = 10, 20, 30, 40, 50, \dots, 100$ centered around the coordinate origin.
3. Count the number of particles inside the circle, $N(R)$ for each radius. This quantity is a stochastic and changes every time when you use a different set of the random number.
4. Repeat the above procedure 100 times and calculate the average number of particles in the circle $\langle N(R) \rangle$.
5. The theory suggests that $\langle N(R) \rangle = CR^d$ where C is a constant and d is the fractal dimension.
6. Plot $\ln \langle N(R) \rangle$ and fit the plot to a line using some curve fitting method. The slope is the fractal dimension.