

CVL867: Atomistic and multiscale modelling

Assignment 2

1. Implement an algorithm to run a 1D random walk with 1000 jumps. Take all constants equal to 1. Plot x and x^2 with respect to the step number.
2. By averaging multiple simulations, check that the mean-square displacement tends to a linear function of the number of steps, with a slope of 1.
3. Check the effect of a “biased” random walk, that is, when the probability to jump to the right is not 50% (try values between 0 and 100%). How does it affect the shape of the average mean-square displacement with respect to the step number?
4. Implement a 2D random walk with 1000 jumps. Show an example of particle trajectory path.
5. Assumes a 10 by 10 square grid with periodic conditions. One drunk sailor is initially placed in (0,0), and a second one in (5,5). By performing multiple simulations, determine the average number of steps after which the two sailors bump into each other.
6. Use Park–Miller random number generator to generate a series of 200 random number with initial seed=71, $a=18$, $m=167$. Find the period of the obtained series. Find the minimum value of ‘a’ for which the period is maximum.