Homework assignment 7

Giodano, page 188, Question 7.2 (modified).

2. Simulate a random walk in two dimensions allowing the walker to make steps of unit length in random directions; don't restrict the walker to sites on a discrete lattice. Show that the motion is diffusive, that is, $< r^2 > = Dt$. Find the value of D.

7.0.3. Sample code 7.4.3 is for a 1-D random walk. It simulates the spreading of an initial distribution of walkers concentrated in a point initially. At a fixed time *t*, the density distribution can be described by a Gaussian curve described by

$y(x) = A\exp\left[-\frac{(x-\mu)^2}{2\sigma^2}\right]$; A is the normalisation constant, σ the width of the curve, μ the average value, = $L/2$ in our case here. Write a code to show that the width of the distribution varies with time as $\sigma(n) = (2Dn)^{1/2}$, D = ½ for the 1-D walkers. *Hint*: you may use FindFit to fit the data from the density distribution against a Gaussian curve. Essentially, you need to show that the density distribution coincides with the curve $y(n) = \sqrt{n}$ for large *n*.

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