

DRUNKARD (SAILOR) RANDOM WALK IN 1D

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1. Graph illustrating relation between $\log(N)$ and $\log(\sigma)$, where:

N - is the number of steps,

σ - standart deviation

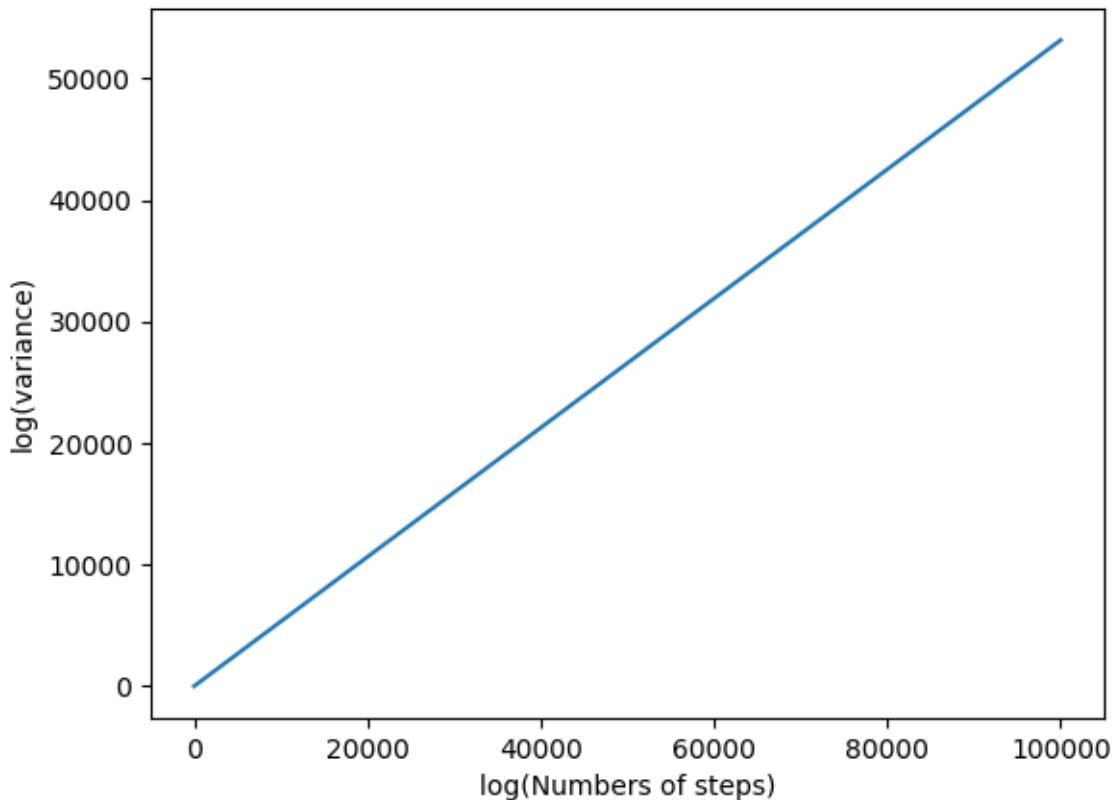


Figure 1: Result from linear regression

Coefficient calculated by linear regression:

$$a = \mathbf{0.53167994} \quad (1)$$

Listing 1: random_walk.f

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2. integer d,N,step ,x,K,i ,j
real xNa, xNa2, u

! number of steps for each try
integer, dimension(10) :: nu
nu(1) = 10
nu(2) = 21.5443469
nu(3) = 46.41588834
nu(4) = 100.
nu(5) = 215.443469
nu(6) = 464.15888336
nu(7) = 1000.
nu(8) = 2154.43469003
nu(9) = 4641.58883361
nu(10) = 10000.

! number of tries
K = 30000
open(1, file='data.txt')
d=-1
do j=1,size(nu)
    N = nu(j)
    u = 0
    xNa = 0
    xNa2 = 0
    do i=1,K
        x=0
        do step=1,N
            if (ran1(d)<0.5) then
                x = x - 1
            else
                x = x + 1
            endif
        enddo
        xNa = xNa + x
        xN2a = xN2a + x*x
    enddo
    u = sqrt((xN2a/float(K)) - ((xNa/float(K)) * (xNa/float(K))))
    write(1,*) N, " ,", u
enddo
close(1)
end

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