

# DRUNKARD (SAILOR) RANDOM WALK IN 1D

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March 20, 2019

1. Graph illustrating relation between  $\log(N)$  and  $\log(\sigma)$ , where:  
 $N$  - is the number of steps,  
 $\sigma$  - standart deviation

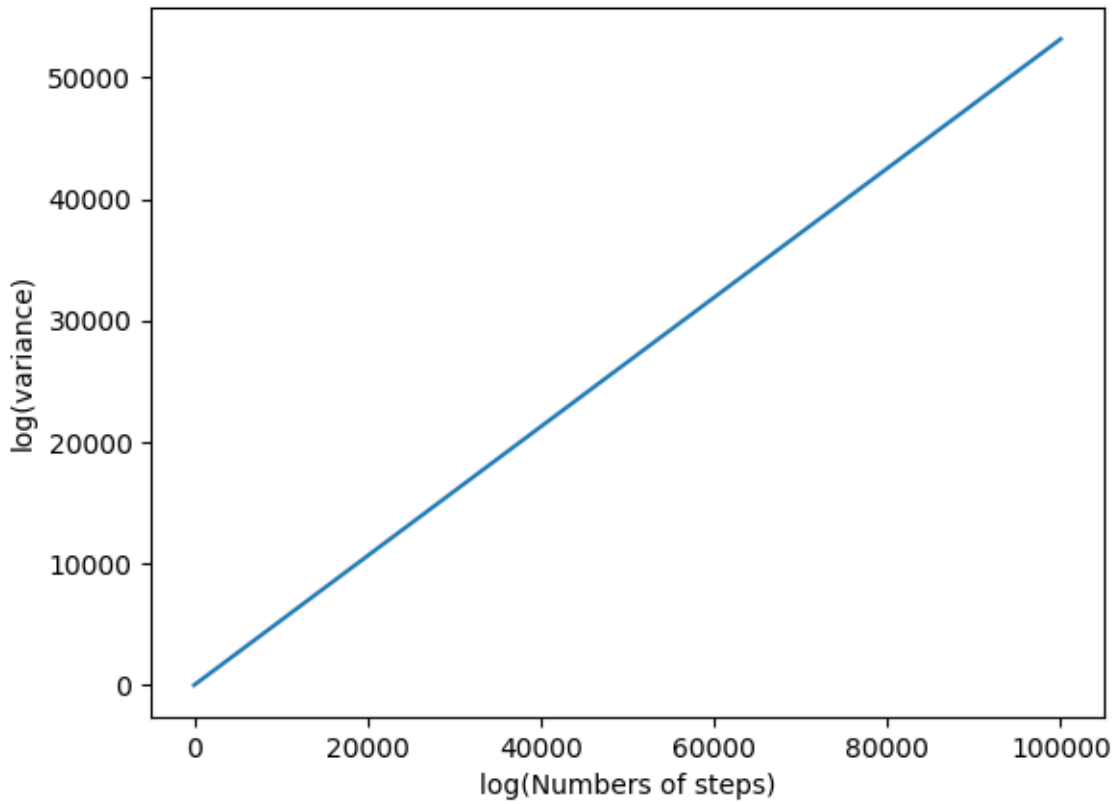


Figure 1: Result from linear regression

Coefficient callculated by linear regression:

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

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

```