DRUNKARD (SAILOR) RANDOM WALK IN 1D

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

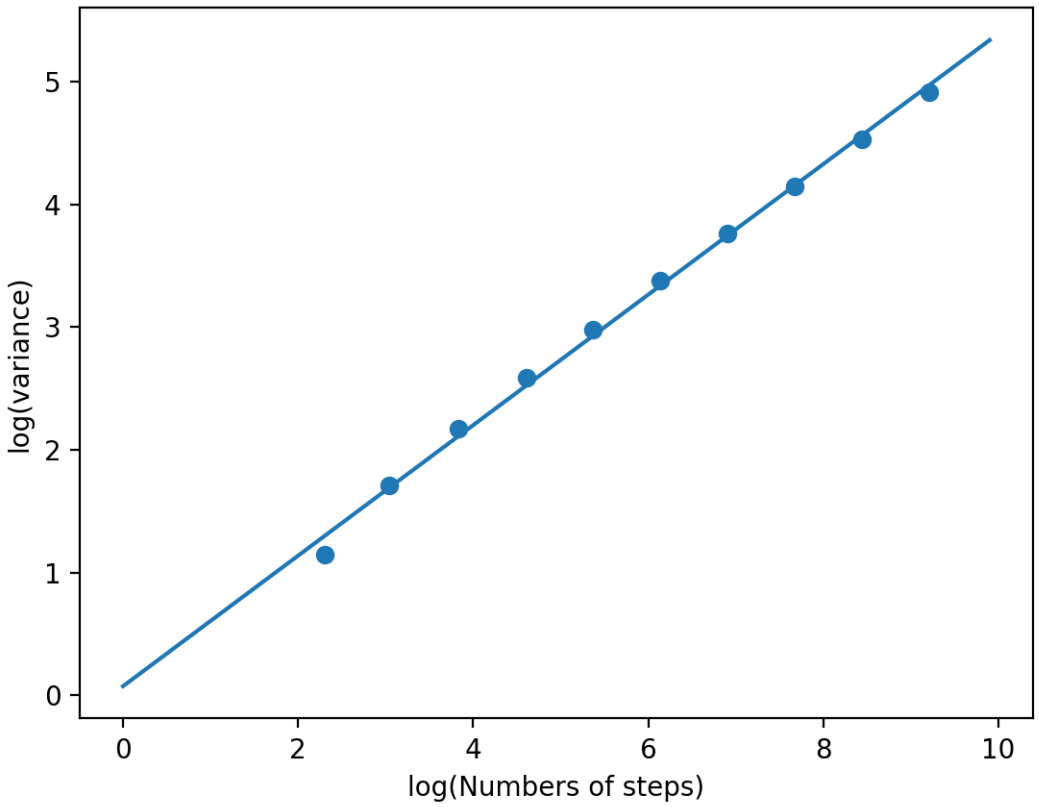

Figure 1: Result from linear regression

Coefficient callculated by linear regression:

$$a = \mathbf{0.53167994} \tag{1}$$

2. Listing 1: random_walk.f

```
      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
```