MXB261

Problem Solving Task

Assessment 1

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Word count: 317

The outcome of the biased random walk simulation shows a clear difference between the fixed and randomized position. After all particles enter from a single column which can be seen in figure 1 and 3, the displacement is quite compact. Furthermore, quite tall vertical stacks rise quite quickly and change the direction of later particles, producing a narrow footprint with a visible skew. The replication run, which can be seen in Figure 3 justifies that the pattern starts to the effect of random seed. Likewise, under the random start condition which can be seen in Figures 2 and 4. Instead of a dominant column, there are large amounts of small stacks being developed at the same time thus creating a more even profile and lower maximum heights.

The influence of the sample size (N) is also visibly clear. When doubling the number of walkers from 100 to 200 both the mean and the maximum column heights increase. Under strict starts from the task sheet, additional walkers strengthen the existing stack and slowly broaden its base which can be seen in the output in Figure 1 and 2. This reflects the relative importance of the position in which points produce strong localized barriers, whereas distributed entry points produce a distributed growth model.

The KL divergence results in figure 5, which shows the mean KL divergence declining systematically as the existing sample size increases through an n (10- 25) empirical distribution. Some bins are empty although despite the small probability floor. After n > 50 the KL and the associated variables start to decrease. Furthermore, after n = 100, the reduction in divergence started to slow. The bar shaft in Figure 6 clearly shows that when n = 10 the PMF diverges significantly while the theoretical curve (n = 175 and 250) is almost identical.

Appendix

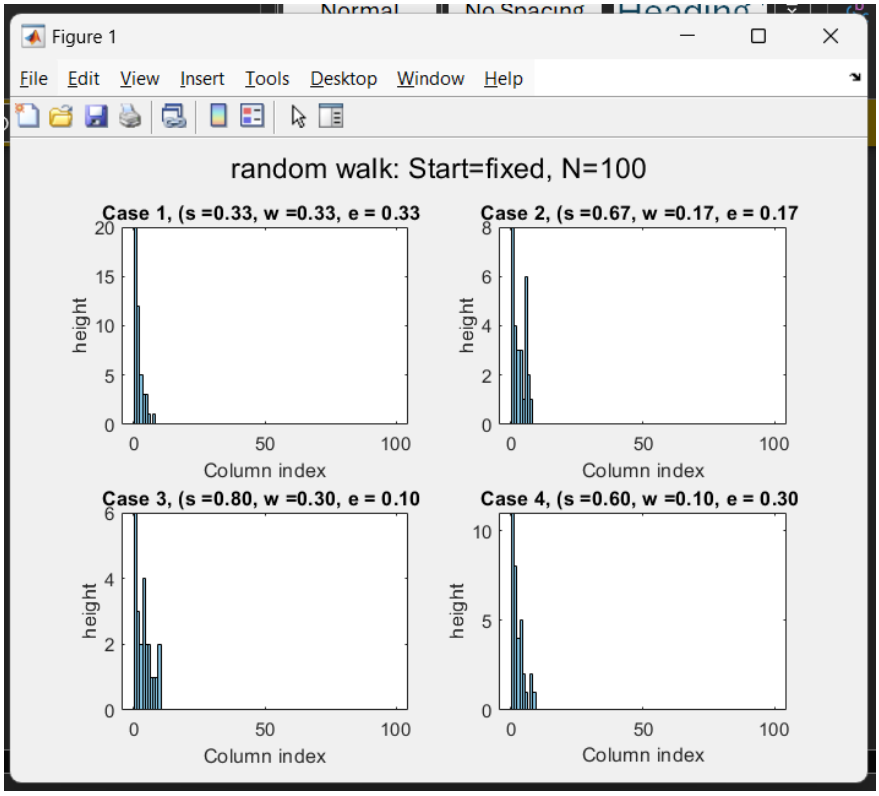
Figure 1
File Edit View Insert Tools Desktop Window Help
random walk: Start=fixed, N=100
Case 1, (s =0.33, w =0.33, e = 0.33
Case 2, (s =0.67, w =0.17, e = 0.17
Case 3, (s =0.80, w =0.30, e = 0.10
Case 4, (s =0.60, w =0.10, e = 0.30
height
Column index
0
50
100

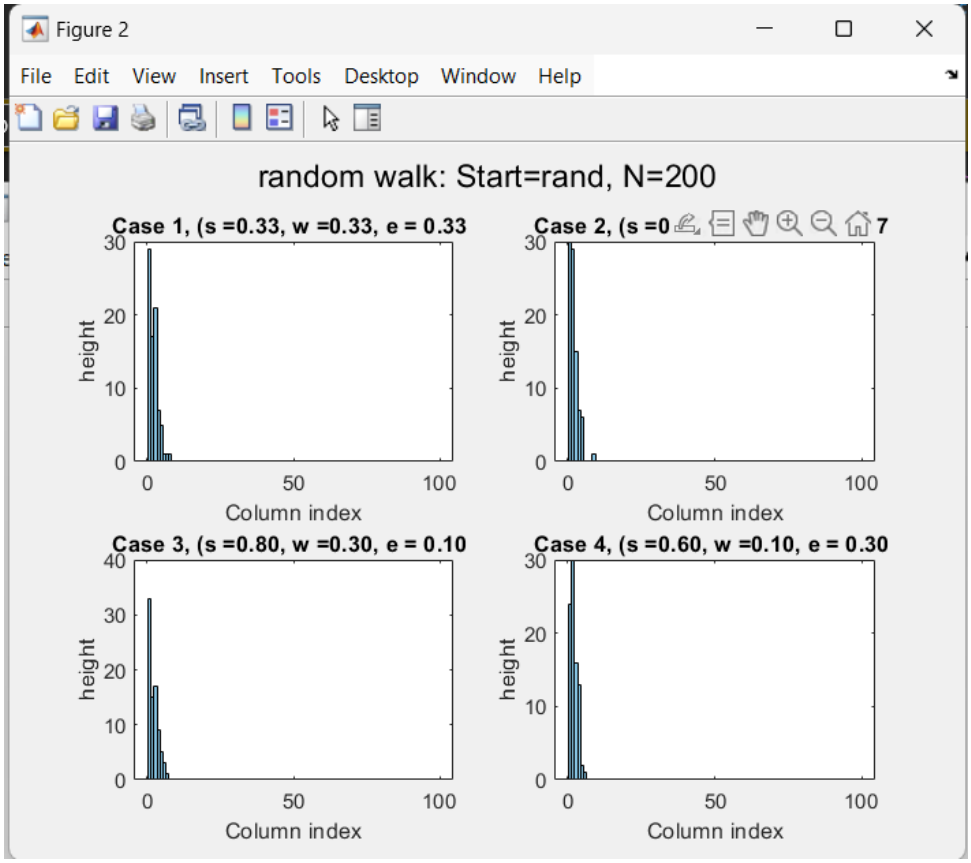
Figure 2
File Edit View Insert Tools Desktop Window Help
random walk: Start=rand, N=200
Case 1, (s =0.33, w =0.33, e = 0.33
Case 2, (s =0
7
Case 3, (s =0.80, w =0.30, e = 0.10
Case 4, (s =0.60, w =0.10, e = 0.30
height
Column index

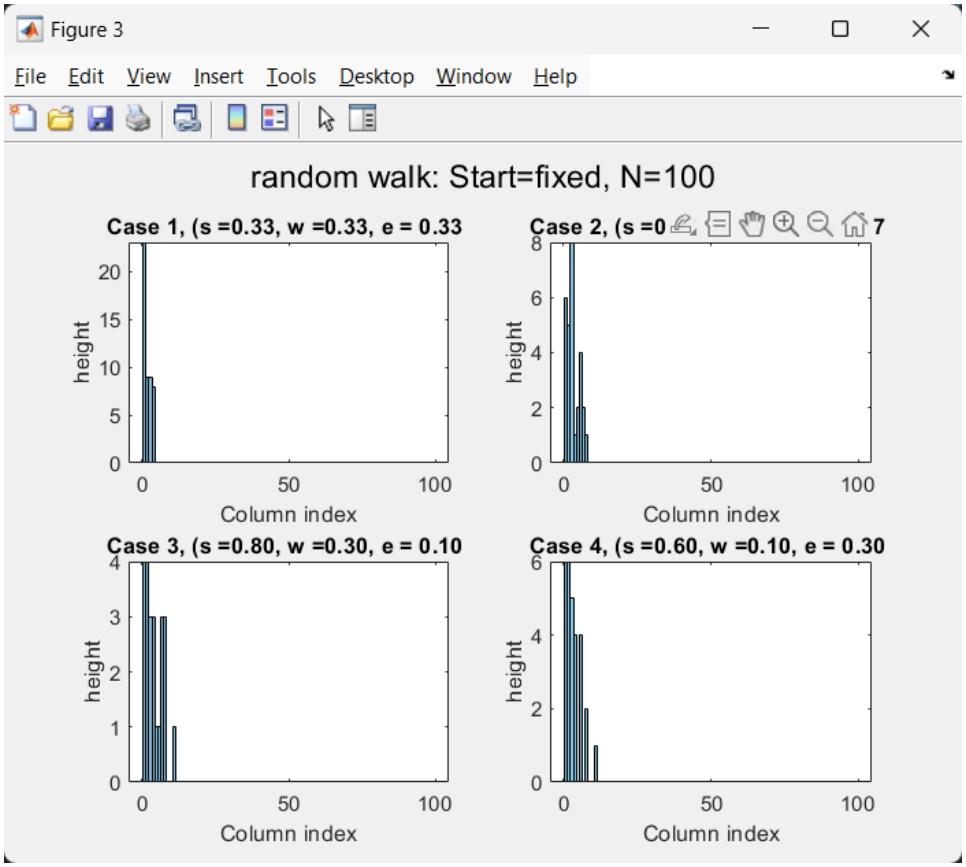
Figure 3
File Edit View Insert Tools Desktop Window Help
random walk: Start=fixed, N=100
Case 1, (s =0.33, w =0.33, e = 0.33
Case 2, (s =0
7
Case 3, (s =0.80, w =0.30, e = 0.10
Case 4, (s =0.60, w =0.10, e = 0.30
height
Column index

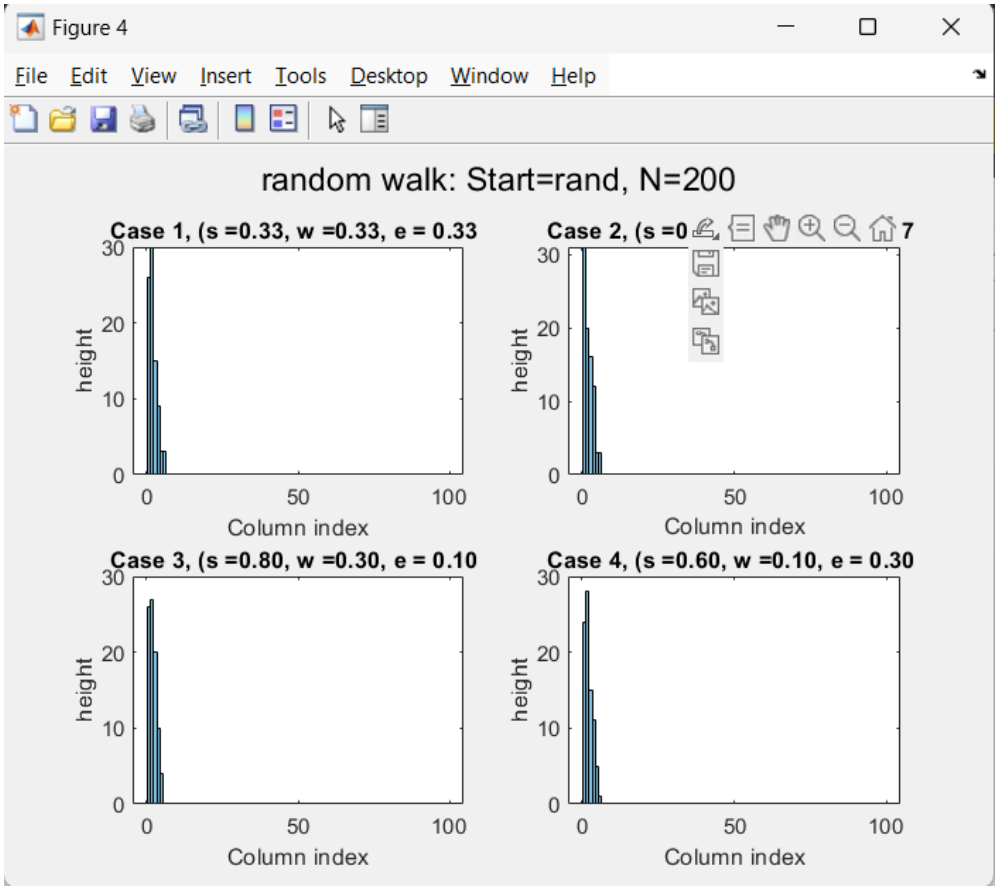
Figure 4
File Edit View Insert Tools Desktop Window Help
random walk: Start=rand, N=200
Case 1, (s =0.33, w =0.33, e = 0.33
Case 2, (s =0
Case 3, (s =0.80, w =0.30, e = 0.10
Case 4, (s =0.60, w =0.10, e = 0.30
height
Column index
0
10
20
30
50
100

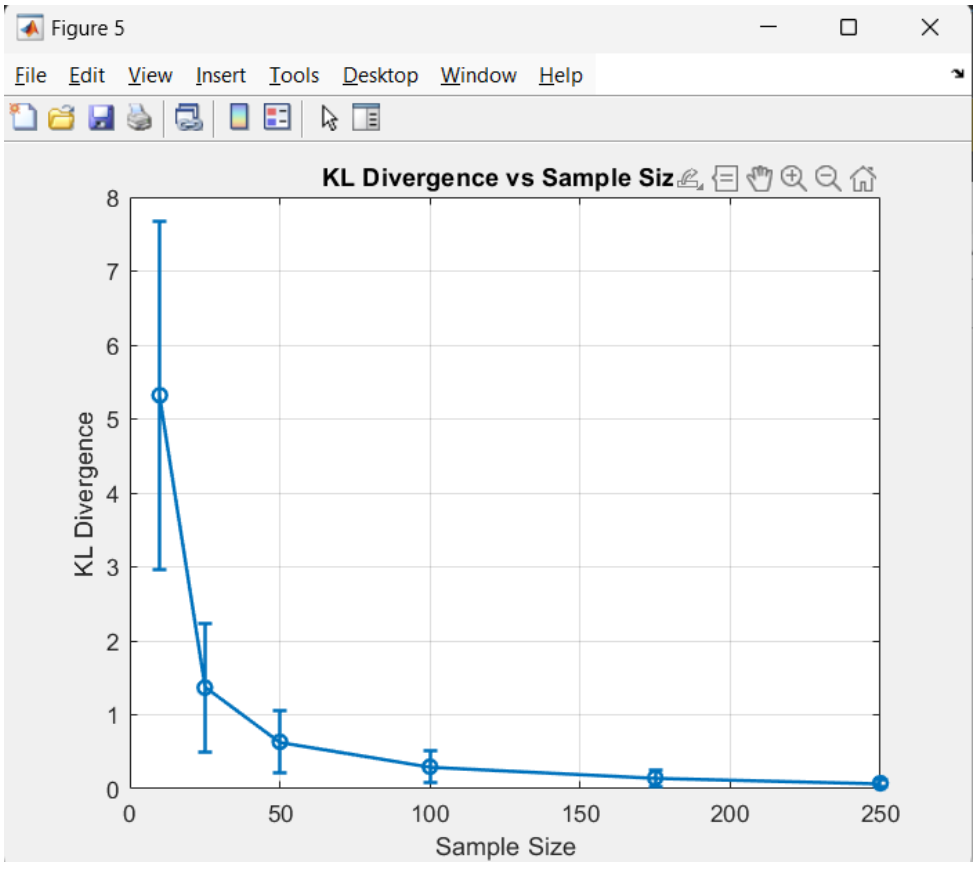
Figure 5
File Edit View Insert Tools Desktop Window Help
KL Divergence vs Sample Siz
KL Divergence
Sample Size
0
1
2
3
4
5
6
7
8
50
100
150
200
250

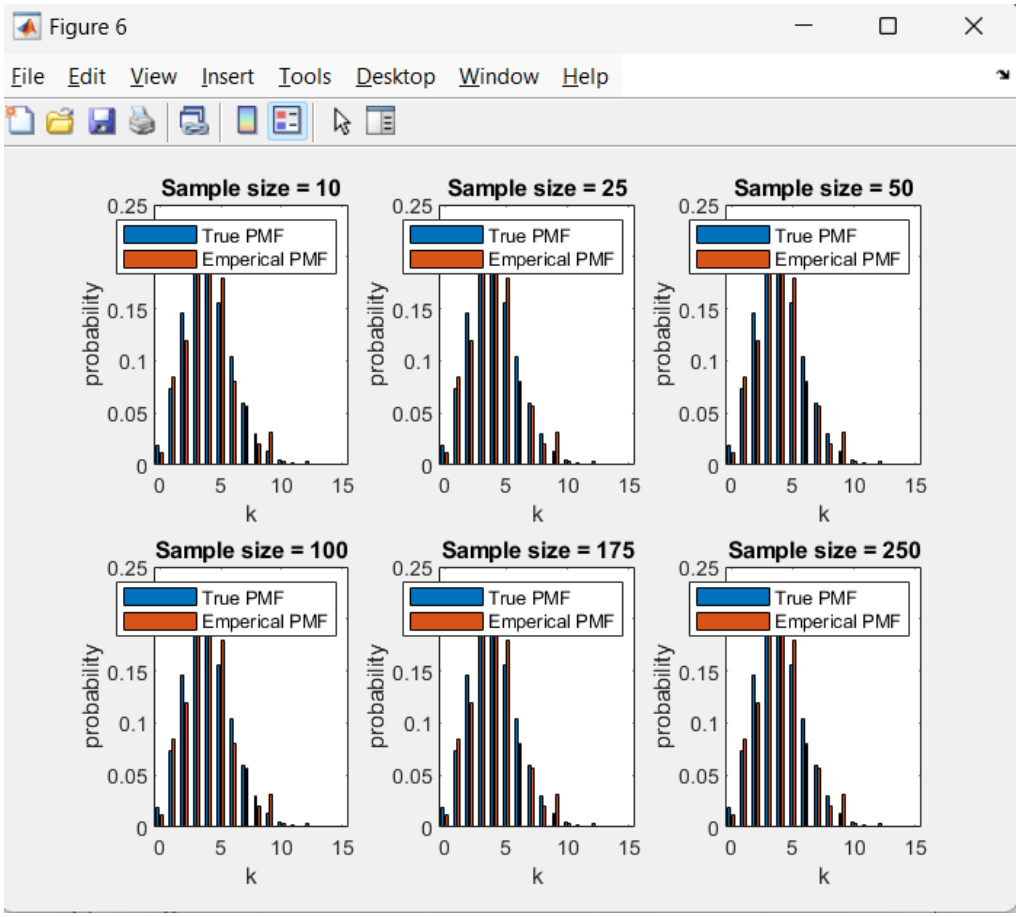
Figure 6
File Edit View Insert Tools Desktop Window Help
Sample size = 10
Sample size = 25
Sample size = 50
Sample size = 100
Sample size = 175
Sample size = 250
True PMF
Emperical PMF
probability
k
0.25
0.15
0.1
0.05
0
0 5 10 15