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**Program Structures & Algorithms**

**Fall 2021**

**Assignment No. 1**

* **Task**

Imagine a drunken man who, starting out leaning against a lamp post in the middle of an open space, takes a series of steps of the same length: 1 meter. The direction of these steps is randomly chosen from North, South, East or West. After n steps, how far (d), generally speaking, is the man from the lamp post? Note that d is the Euclidean distance of the man from the lamp-post.

* **Relationship Conclusion:**

d=n^(1/2)

‘d’ is the Euclidean distance of the man from the lamp post, ‘N’ is the steps taken by the man.

* **Evidence to support the conclusion:**

1. **Output**

**Snapshot of Code output:**

The number of steps is set to 1-100 steps, and 100 experiments are carried out for each step number.

The code is submitted to the github. The address of github is:

<https://github.com/ZixuanZhu-faye/INFO-6205/blob/0cbd37a0b9a35cc9f932ea3f66d1e5ce009247c6/INFO6205-Fall2021/src/main/java/edu/neu/coe/info6205/randomwalk/RandomWalk.java>

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(a)

(b)

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Figure 1 Snapshots of Code Output

1. **Graphical Representation**

Import the value of ‘step’ (n in the conclusion) and its corresponding average distance(d in the conclusion) into excel, and analyzed by plotting graphs.

表格

描述已自动生成In the line chart, the x-axis represents the number of steps the man takes (n), the y-axis represents the average distance of the man from the lamp post after 100 experiments when the number of steps is n.

Figure 2 Part of data in the excel

图表, 散点图

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Figure 3 the Graph represents the relationship between steps(n) and distance(d)

Through the graph obtained by fitting d and n in excel, it is concluded that the relationship between d and n satisfies d=n^(1/2). So the conclusion mentioned above is valid.

* 图形用户界面, 文本, 应用程序

  描述已自动生成**Unit tests result:**