

Program Structures & Algorithms

Fall 2021

Assignment No. 1

- **Tasks:**

- Calculated (Euclidean) distance from the origin (the lamp post) to the destination(position after the random walk).
- Ran the same experiment with various numbers of steps and 50 times for each value of steps.
- Derived the relationship between the number of steps and the distance covered.

- **Relationship Conclusion:**

- *The mean distance($\frac{\text{total distance in all the experiments}}{\text{total number of experiments}}$) = $\sqrt{\text{steps taken in each experiment}}$*

- **Evidence to support the conclusion:**

1. The output of the program:

```
RandomWalk.java x
Run: RandomWalk x
/usr/lib/jvm/java-1.11.0-openjdk-amd64/bin/java ...
4 steps: 1.6698256536101197 over 50 experiments
8 steps: 2.0338578460626007 over 50 experiments
16 steps: 3.490237484836728 over 50 experiments
25 steps: 4.377679844719308 over 50 experiments
36 steps: 6.2736783437040184 over 50 experiments
49 steps: 6.426565244750359 over 50 experiments
64 steps: 7.089987790451094 over 50 experiments
81 steps: 7.53886048343617 over 50 experiments
100 steps: 9.018816668786746 over 50 experiments

Process finished with exit code 0
```

2. Graphical Representation:

Steps	Mean Distance
4	1.6698
8	2.0338
16	3.4902
25	4.3776
36	6.2736
49	6.4265
64	7.0899
81	7.5388
100	9.0188



- **Unit Tests Results:**

The screenshot displays the IntelliJ IDEA IDE interface. The top status bar indicates the system time as 1:22 PM and the CPU usage as 98%. The main editor window shows the file `INFO6205 - RandomWalk.java`. The code defines a `RandomWalk` class with a `move` method that updates the `x` and `y` coordinates based on a random direction. The class also includes a `main` method that demonstrates the `move` method. The `Run` tab at the bottom shows the execution results of the `RandomWalkTest` class, indicating that all 6 tests passed successfully within 318 ms. The test results are as follows:

Test Name	Duration (ms)
testRandomWalk2	18 ms
testMove0	3 ms
testMove1	4 ms
testMove2	3 ms
testMove3	2 ms
testRandomWalk	288 ms