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Program Structures & Algorithms

Fall 2021

Assignment No. 1

- ◉ Task (List down the tasks performed in the Assignment)

Radom Walk

- ◉ Relationship Conclusion: $d = \sqrt{n}$
- ◉ \$Evidence to support the conclusion:

1. Output (Snapshot of Code output in the terminal)

```
<terminated> RandomWalk [Java Application] /Library/Java/JavaVirtualMachines/jdk1.8.0_162.jdk/Contents/Home/bin/ji
We walked 25 steps in 60 experiments and the mean distance is 4.4156944084039695
We walked 100 steps in 60 experiments and the mean distance is 8.941403827977977
We walked 1600 steps in 60 experiments and the mean distance is 35.72083205934917
We walked 160000 steps in 60 experiments and the mean distance is 384.60981318580787|
We walked 250000 steps in 60 experiments and the mean distance is 430.45897689985526
We walked 1000000 steps in 60 experiments and the mean distance is 962.2042879063238
```

2. **Graphical Representation(Observations from experiments should be tabulated and analyzed by plotting graphs(usually in excel) to arrive on the relationship conclusion)**

$$d_1 = \sqrt{(x_1 - 0)^2 + (y_1 - 0)^2} d^2$$

$$= \frac{1}{p} \left(\sum_{i=1}^p (x_{i1} + x_{i2} + x_{i3} + \dots + x_{in})^2 + (y_{i1} + y_{i2} + y_{i3} + \dots + y_{in})^2 \right)$$

$$d1 = \frac{1}{p} \sum_{i=1}^p (x_{i1}^2 + x_{i1}x_{i2} + x_{i1}x_{i3} + \dots + x_{i2}^2 + x_{i1}x_{i2} + \dots x_{in}^2 + y_{i1}^2 + y_{i1}y_{i2} + y_{i1}y_{i3} + \dots + y_{i2}^2 + y_{i1}y_{i2} + \dots y_{in}^2)$$

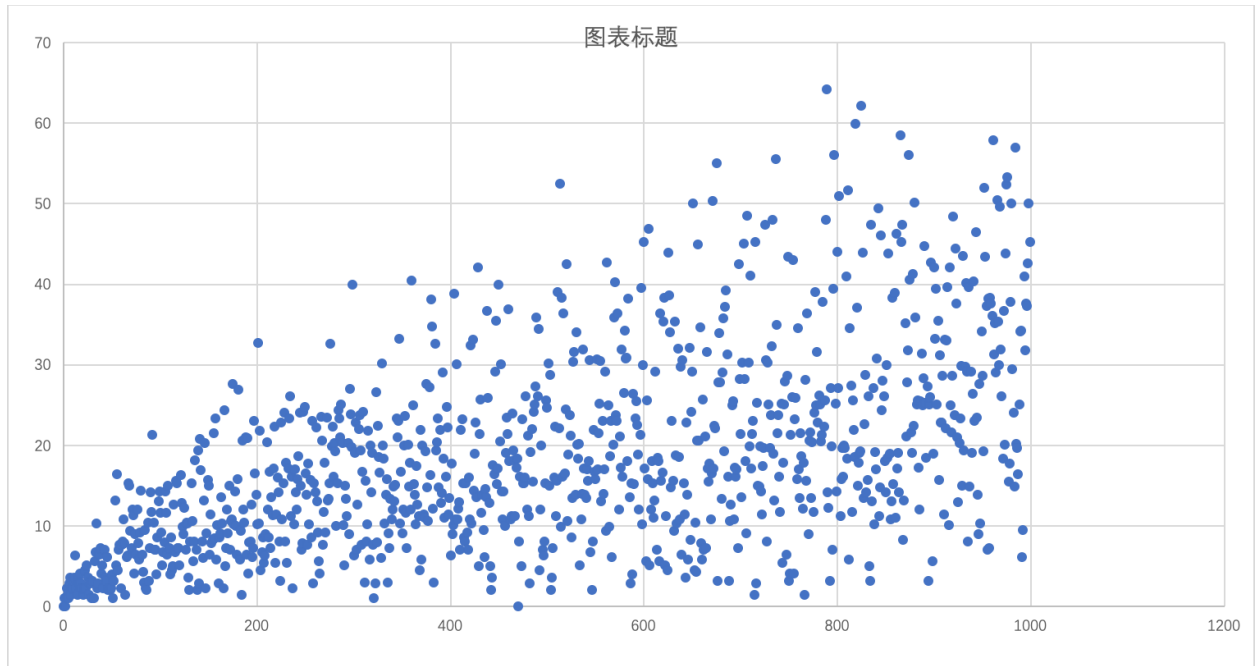
$$d^2 = \frac{1}{p} \sum_{i=1}^p (x_{i1}^2 + x_{i1}x_{i2} + x_{i1}x_{i3} + \dots + x_{i2}^2 + x_{i1}x_{i2} + \dots x_{in}^2 + y_{i1}^2 + y_{i1}y_{i2} + y_{i1}y_{i3} + \dots + y_{i2}^2 + y_{i1}y_{i2} + \dots y_{in}^2)$$

$$d^2 = \frac{1}{p} \sum_{i=1}^p (x_{i1}^2 + y_{i1}^2 + x_{i2}^2 + y_{i2}^2 + \dots x_{in}^2 + y_{in}^2)$$

$$d^2 = \frac{1}{p} \sum_{i=1}^p (n)$$

$$d^2 = n$$

$$d = \sqrt{n}$$



◦ Unit tests result:(Snapshot of successful unit test run)

The screenshot displays an IDE interface with the following components:

- Package Explorer:** Shows the project structure with 'Assignment1.Assignment1.RandomWalkTest' selected. It lists test methods: testRandomWalk2 (0.000 s), testMove0 (0.000 s), testMove1 (0.010 s), testMove2 (0.006 s), testMove3 (0.003 s), and testRandomWalk (1.060 s).
- JUnit Console:** Displays the test results: 'Finished after 1.105 seconds', 'Runs: 6/6', 'Errors: 0', and 'Failures: 0'.
- Source Editor:** Contains the Java code for 'RandomWalkTest'. It includes imports for JUnit, a package declaration, and two test methods: testMove0 and testMove1. Both methods use 'assertEquals' to verify the distance of a random walk.
- Outline:** Lists the test methods: testMove0, testMove1, testMove2, testMove3, testRandomWalk, and testRandomWalk2.
- Problems:** Shows a message: '<terminated> RandomWalkTest [JUnit] /Library/Java/JavaVirtualMachines/jdk1.8.0_162.jdk/Contents/Home/bin/java (Sep 16, 2021, 2:19:42 PM)'.