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Program Structures & Algorithms

Fall 2021

Assignment No. 1

- **Task**

  Question:

  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?

  Procedure:

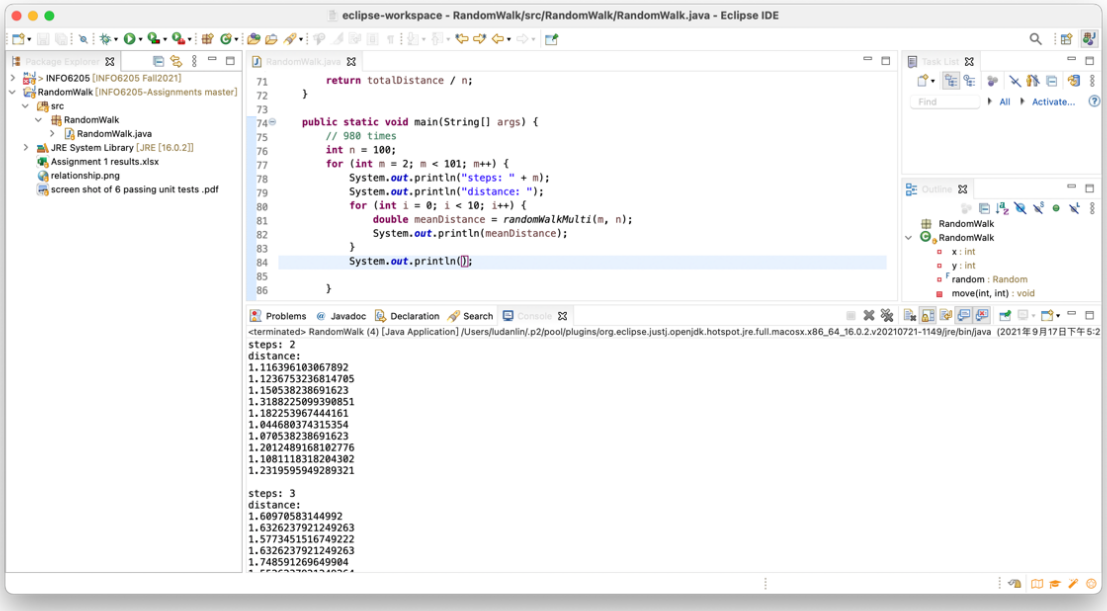
  1. **Implement all blank methods in RandomWalk.java**
  2. **Pass all the unit tests**
  3. **Draw conclusion on the relationship between the number of steps (n) and the distance from the origin (d)**
  4. **Prove the conclusion with graphs**

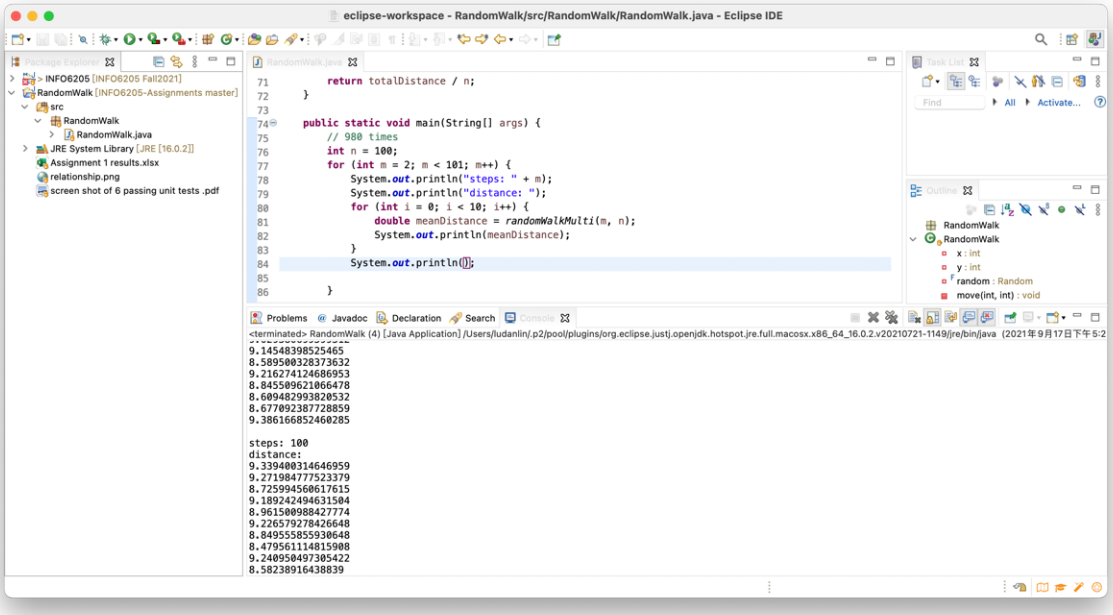
- **Relationship Conclusion:** $\boldsymbol{d = \sqrt{n}\ \ or\ \ n = d^2}$

- **Evidence to support the conclusion:**

1. **Output**

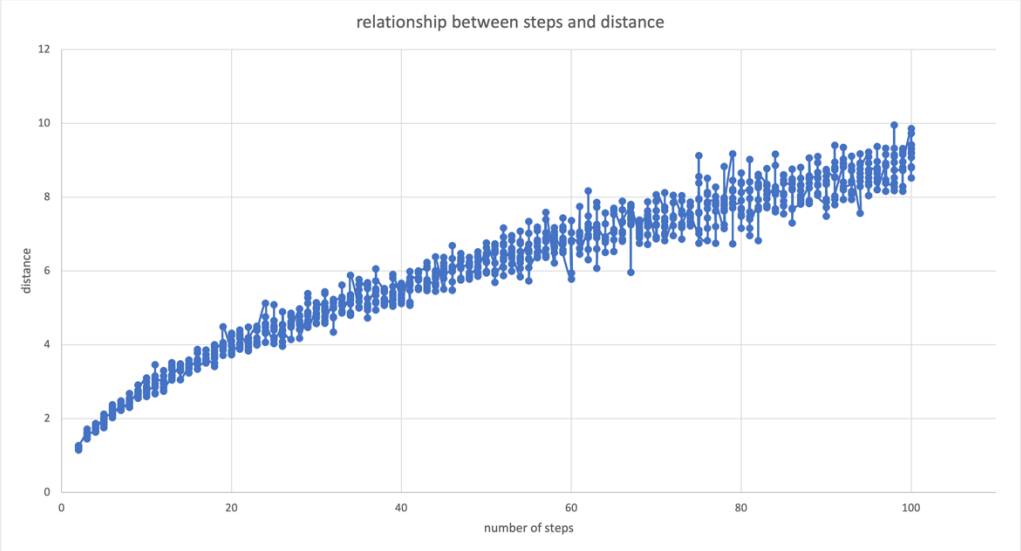
   As there are total 990 numbers for distance, I just give two snap-shots here, which are the beginning and the ending of the results.



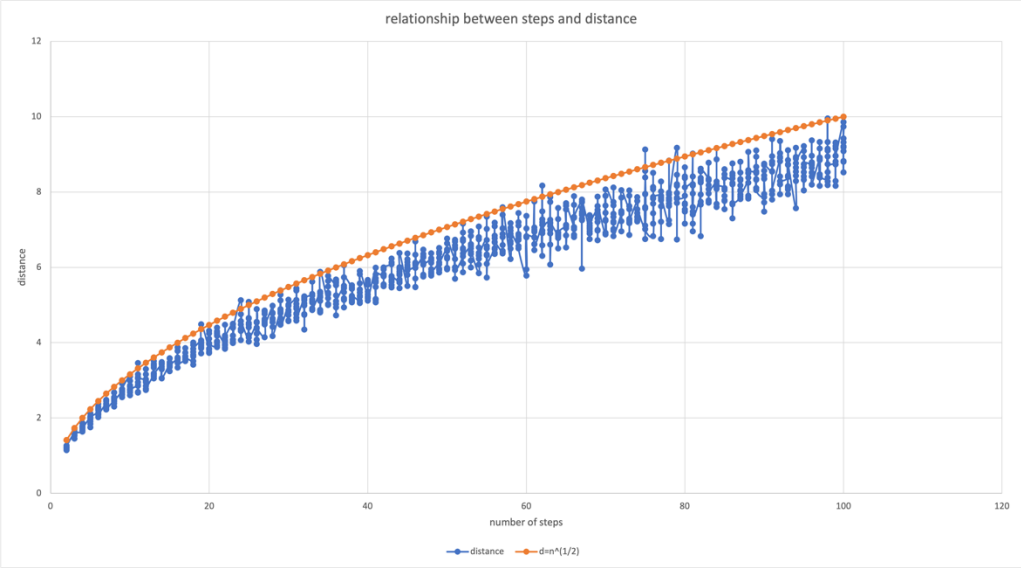


2. Graphical Representation

The dot graph observed:



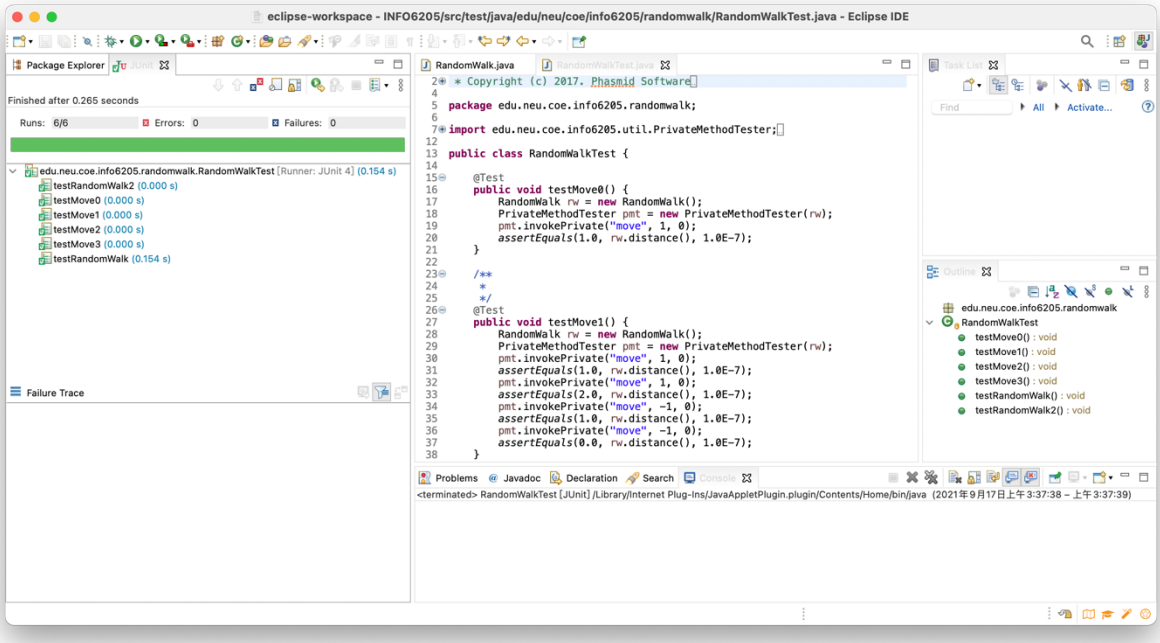
And then I plot the line of $d = \sqrt{n}$ (orange line) with the observed points:

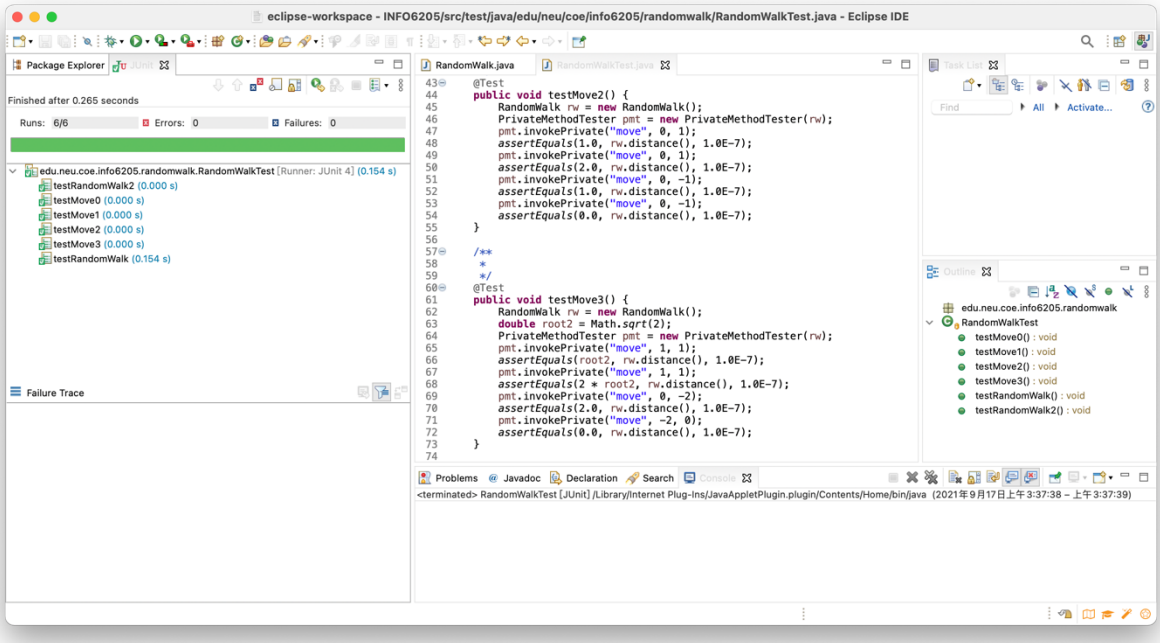


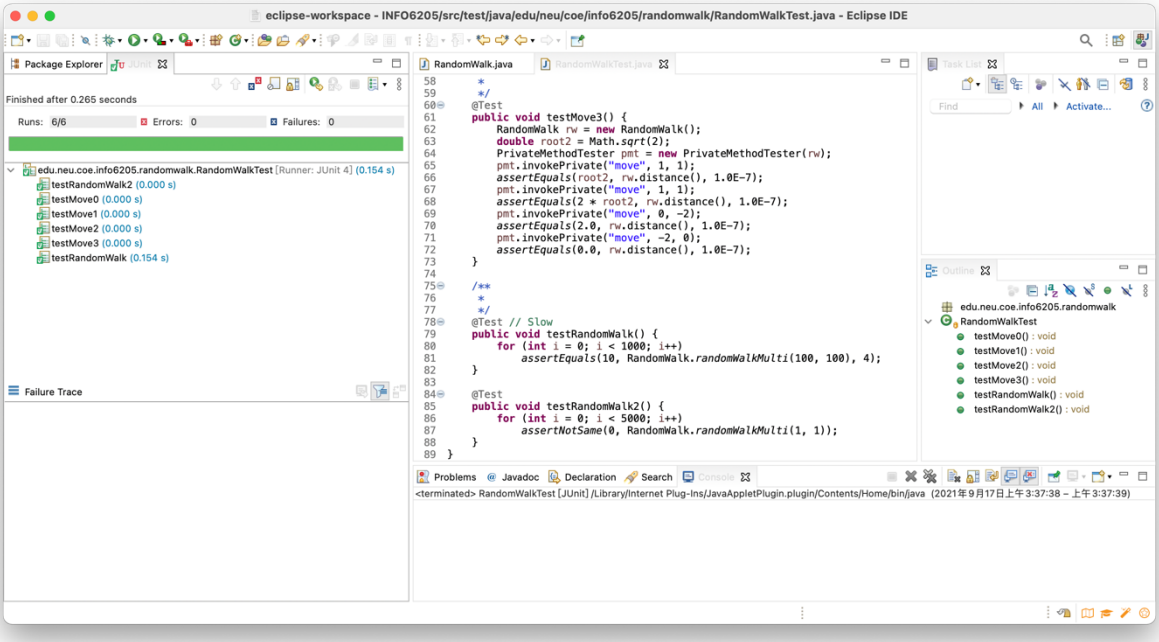
I find that the orange line can describe the blue points observed, meaning that the relationship between d and n is $d = \sqrt{n}$.

- **Unit tests result:**

  All 6 unit tests are pass and none of code is modified:






eclipse-workspace - INFO6205/src/test/java/edu/neu/coe/info6205/randomwalk/RandomWalkTest.java - Eclipse IDE
Package Explorer
JUnit
Finished after 0.265 seconds
Runs: 6/6
Errors: 0
Failures: 0
edu.neu.coe.info6205.randomwalk.RandomWalkTest [Runner: JUnit 4] (0.154 s)
testRandomWalk2 (0.000 s)
testMove0 (0.000 s)
testMove1 (0.000 s)
testMove2 (0.000 s)
testMove3 (0.000 s)
testRandomWalk (0.154 s)
Failure Trace
RandomWalk.java
RandomWalkTest.java
58 *
59 */
60 @Test
61 public void testMove3() {
62 RandomWalk rw = new RandomWalk();
63 double root2 = Math.sqrt(2);
64 PrivateMethodTester pmt = new PrivateMethodTester(rw);
65 pmt.invokePrivate("move", 1, 1);
66 assertEquals(root2, rw.distance(), 1.0E-7);
67 pmt.invokePrivate("move", 1, 1);
68 assertEquals(2 * root2, rw.distance(), 1.0E-7);
69 pmt.invokePrivate("move", 0, -2);
70 assertEquals(2.0, rw.distance(), 1.0E-7);
71 pmt.invokePrivate("move", -2, 0);
72 assertEquals(0.0, rw.distance(), 1.0E-7);
73 }
74
75 /**
76 *
77 */
78 @Test // Slow
79 public void testRandomWalk() {
80 for (int i = 0; i < 1000; i++)
81 assertEquals(10, RandomWalk.randomWalkMulti(100, 100), 4);
82 }
83
84 @Test
85 public void testRandomWalk2() {
86 for (int i = 0; i < 5000; i++)
87 assertNotSame(0, RandomWalk.randomWalkMulti(1, 1));
88 }
89 }
Task List
Find
All
Activate...
Outline
edu.neu.coe.info6205.randomwalk
RandomWalkTest
testMove0() : void
testMove1() : void
testMove2() : void
testMove3() : void
testRandomWalk() : void
testRandomWalk2() : void
Problems
Javadoc
Declaration
Search
Console
<terminated> RandomWalkTest [JUnit] /Library/Internet Plug-Ins/JavaAppletPlugin.plugin/Contents/Home/bin/java (2021年9月17日上午3:37:38 – 上午3:37:39)