Assignment 1 – Random Walk

Course: INFO6205

Professor: Robin Hillyard

Student Name: Natarajan Lekshmi Narayana Pillai

NUID: 002766033

Conclusion

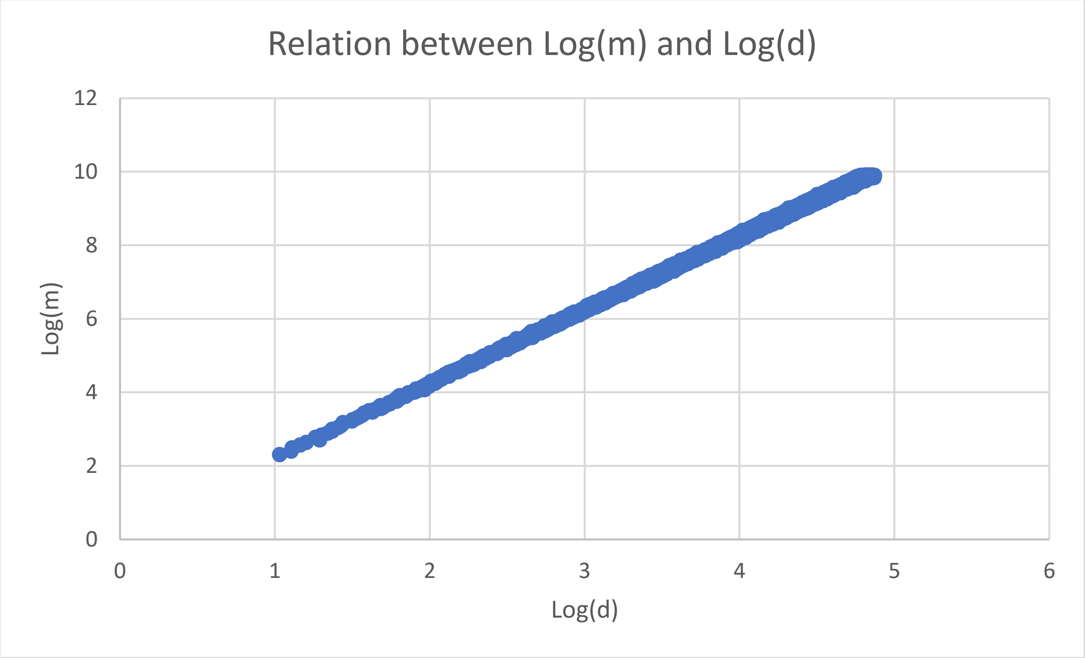
As seen from the data and the graphs, there is a proportional relation between “m” and “d”, where “m” is the number of steps and “d” is the distance from the starting point.

To find the relation between “m” and “d”, I imagined the equation to be m = cd^x. From here I put log on both sides to get Log(m) = xLog(d) +Log(c). Assuming that the line is passing through the origin, Log(c) will become irrelevant, and the equation will simplify to its final form x = Log(m)/Log(d), where x is the ratio.

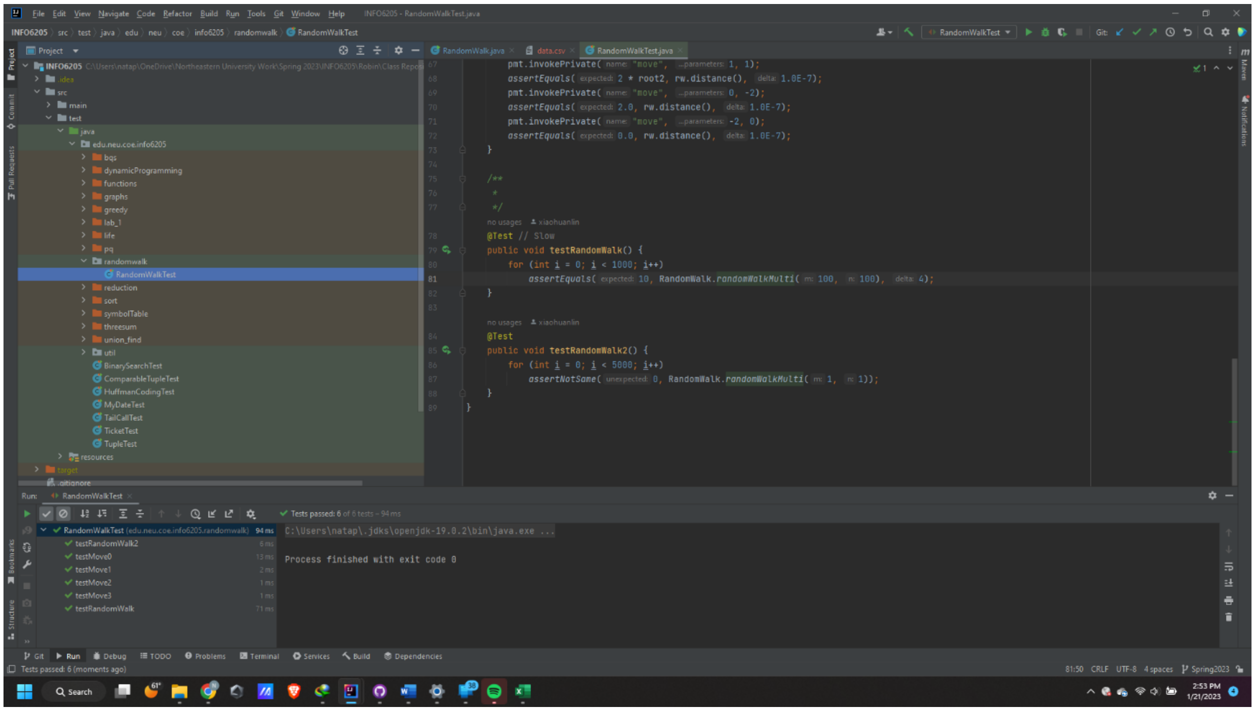
After calculating the average of the ratio using the values we got from the 20000 test cases, we get the ratio as 2.056861. Therefore, the final equation would be m = d^2, stating that the ratio (x) is equal to 2.

The relation between “m” and “d” can also be seen clearly when plotting log(m) by log(d), which produces a relatively straight line.

Evidence



Unit Test Passed Proof



```java
        pmt.invokePrivate( name: "move",  ...parameters: 1, 1);
        assertEquals( expected: 2 * root2, rw.distance(),  delta: 1.0E-7);
        pmt.invokePrivate( name: "move",  ...parameters: 0, -2);
        assertEquals( expected: 2.0, rw.distance(),  delta: 1.0E-7);
        pmt.invokePrivate( name: "move",  ...parameters: -2, 0);
        assertEquals( expected: 0.0, rw.distance(),  delta: 1.0E-7);
    }

    /**
     *
     */
    no usages  xiaohuanlin
    @Test // Slow
    public void testRandomWalk() {
        for (int i = 0; i < 1000; i++)
            assertEquals( expected: 10, RandomWalk.randomWalkMulti( m: 100,  n: 100),  delta: 4);
    }

    no usages  xiaohuanlin
    @Test
    public void testRandomWalk2() {
        for (int i = 0; i < 5000; i++)
            assertNotSame( unexpected: 0, RandomWalk.randomWalkMulti( m: 1,  n: 1));
    }
}
```

Run: RandomWalkTest

✓ Tests passed: 6 of 6 tests – 94 ms

```
✓ RandomWalkTest (edu.neu.coe.info6205.randomwalk) 94 ms
    ✓ testRandomWalk2                                6 ms
    ✓ testMove0                                     13 ms
    ✓ testMove1                                      2 ms
    ✓ testMove2                                      1 ms
    ✓ testMove3                                      1 ms
    ✓ testRandomWalk                                71 ms
```

```
C:\Users\natap\.jdks\openjdk-19.0.2\bin\java.exe ...

Process finished with exit code 0
```

Tests passed: 6 (moments ago)