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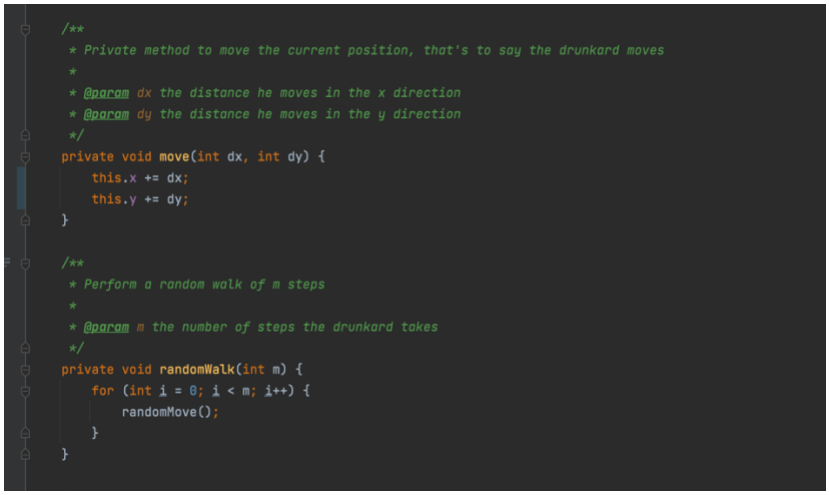
INFO 6205 - Assignment 1

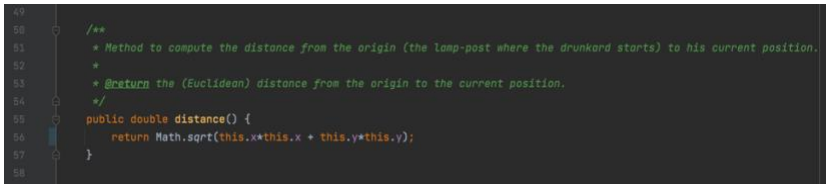
1) Implementations/Changes Made:

Implemented Methods move, randomWalk and distance. Modified main method to run all experiments in one shot. Also added code to generate CSV.

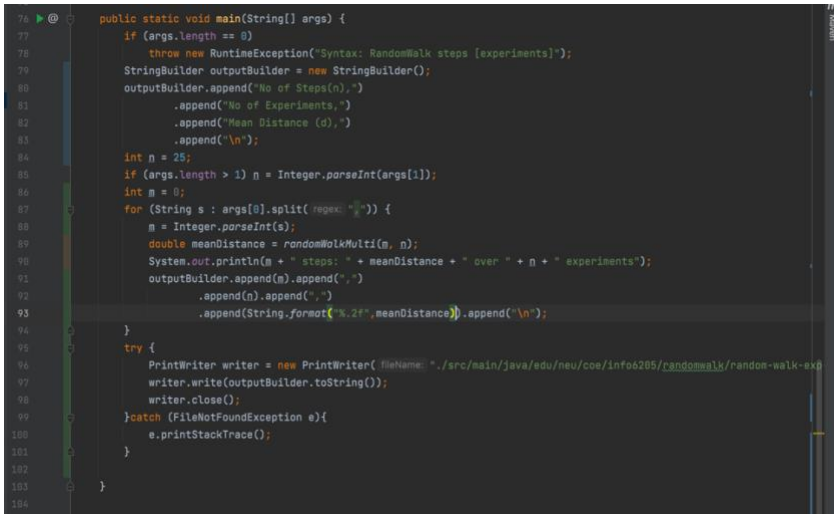


```java
/**
 * Private method to move the current position, that's to say the drunkard moves
 *
 * @param dx the distance he moves in the x direction
 * @param dy the distance he moves in the y direction
 */
private void move(int dx, int dy) {
    this.x += dx;
    this.y += dy;
}

/**
 * Perform a random walk of m steps
 *
 * @param m the number of steps the drunkard takes
 */
private void randomWalk(int m) {
    for (int i = 0; i < m; i++) {
        randomMove();
    }
}
```



```java
/**
 * Method to compute the distance from the origin (the lamp-post where the drunkard starts) to his current position.
 *
 * @return the (Euclidean) distance from the origin to the current position.
 */
public double distance() {
    return Math.sqrt(this.x*this.x + this.y*this.y);
}
```



```java
public static void main(String[] args) {
    if (args.length == 0)
        throw new RuntimeException("Syntax: RandomWalk steps [experiments]");
    StringBuilder outputBuilder = new StringBuilder();
    outputBuilder.append("No of Steps(n),")
            .append("No of Experiments,")
            .append("Mean Distance (d),")
            .append("\n");
    int n = 25;
    if (args.length > 1) n = Integer.parseInt(args[1]);
    int m = 0;
    for (String s : args[0].split( regex: ",")) {
        m = Integer.parseInt(s);
        double meanDistance = randomWalkMulti(m, n);
        System.out.println(m + " steps: " + meanDistance + " over " + n + " experiments");
        outputBuilder.append(m).append(",")
                .append(n).append(",")
                .append(String.format("%.2f",meanDistance)).append("\n");
    }
    try {
        PrintWriter writer = new PrintWriter( fileName: "./src/main/java/edu/neu/coe/info6205/randomwalk/random-walk-ex
        writer.write(outputBuilder.toString());
        writer.close();
    }catch (FileNotFoundException e){
        e.printStackTrace();
    }

}
```

2) Conclusion:

From the values obtained from the experiment, by plotting & interpolating the values on a graph it can be observed that the mean distance (d) is approximately equal to square root of no of steps (n).

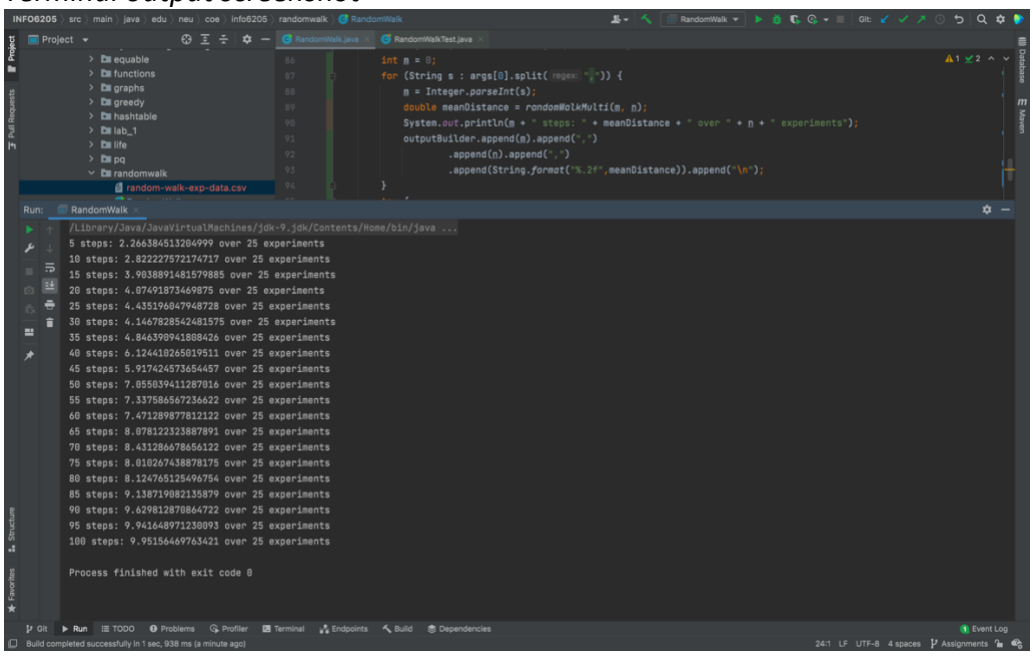
$$d \approx \sqrt{n}$$

Where d = mean Euclidean distance from the lamp, n = number of steps.

3) Evidence:

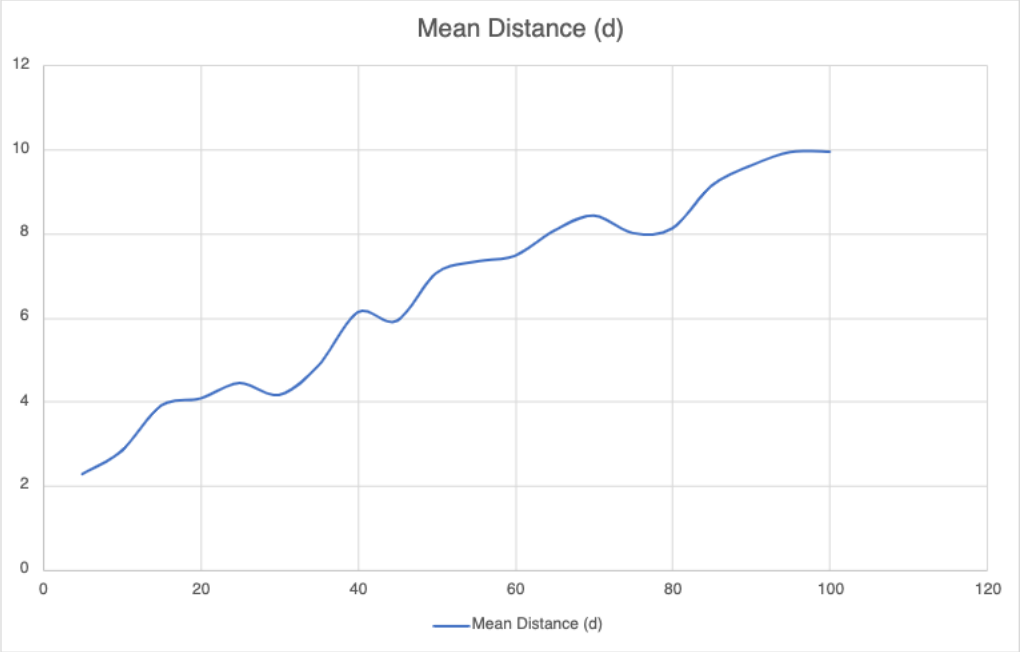
A graph was plotted using the obtained values and then interpolated. The values of an interpolated line are approximately equal to the values of the square root of the number of steps made(n).

Terminal output screenshot

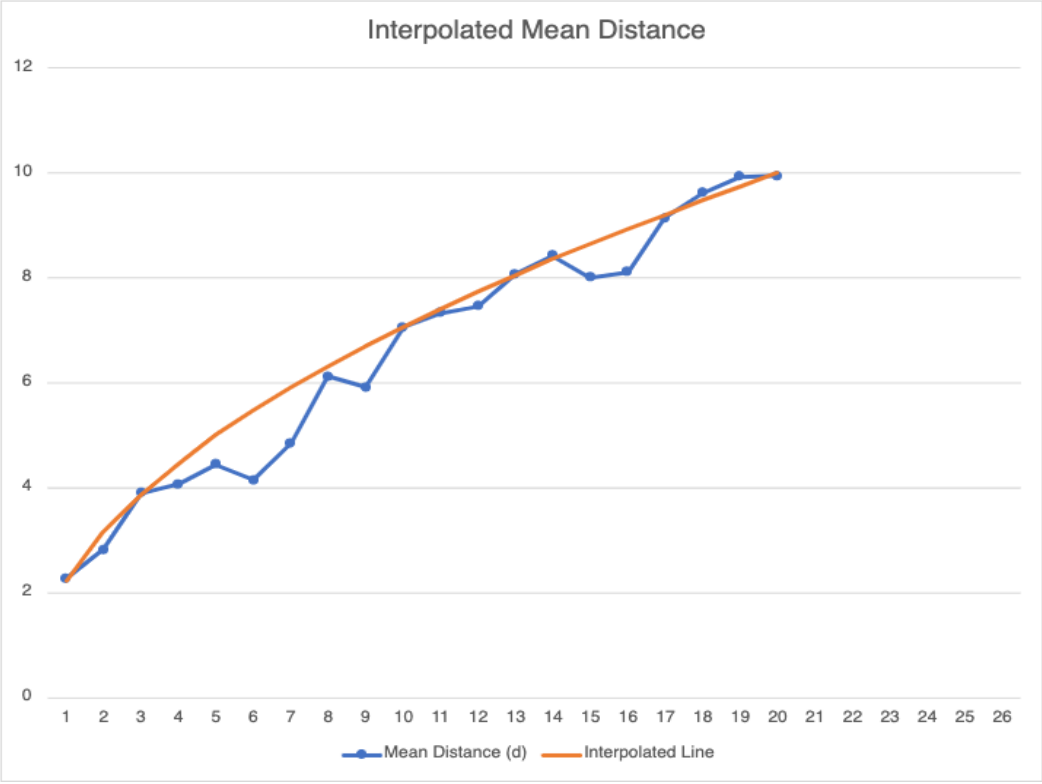


For plotting the graph values are rounded off to 2 decimals.
Excel sheet URL: https://northeastern-my.sharepoint.com/:x:/g/personal/vemula_v_northeastern_edu/EV_TYOS0WlJCpAHWZxazdFQBPI9Cf7XNWib5CX3Vjq-pqA?e=b5tAIV

d vs n graph



Graph showing Mean distance and interpolated line



4) Unit Tests:

Unit tests screenshot