

Nishay Madhani (00212195)

Program Structures & Algorithms

Fall 2021

Assignment No. 3

1. Tasks Performed

1. Implemented the *UF_HWQUPC.java* Class with Size-Weighted Quick Union with path compression and ran the unit tests provided.
2. Added a *Assignment3.java* to *src/.../assignments*, with a main and count.
3. Plotted results from count to a graph using *JFreeChart*

2. Conclusion:

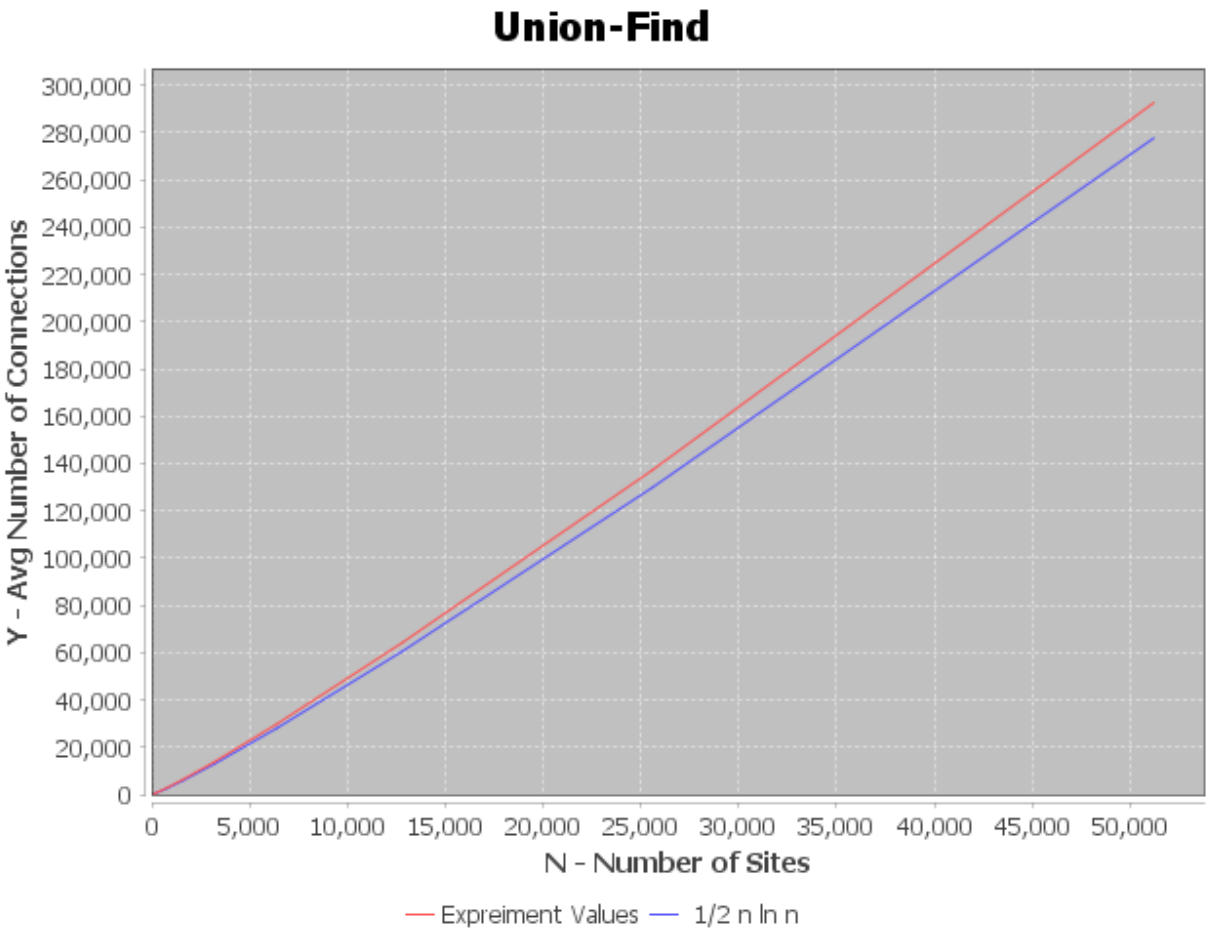
$m = 0.5 * N * \lg N$, m = number of connections, N = no of sites

3. Relationship

N	M	N log N	0.5 N log N
100	252	460	230
200	572	1060	530
400	1216	2400	1200
800	2543	5400	2700

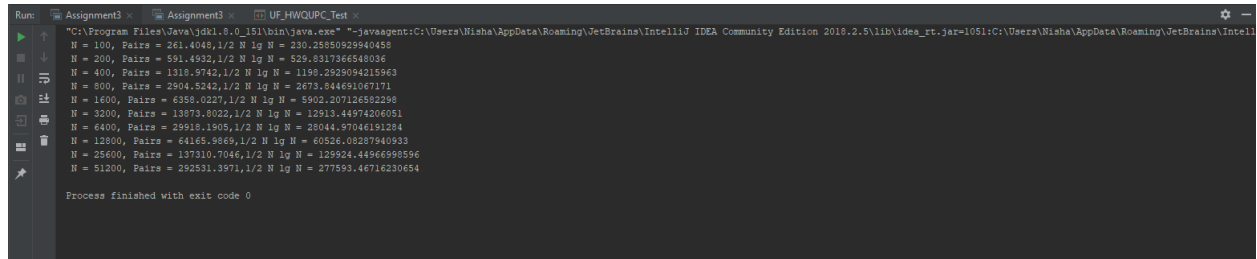
1600	6379	11800	5900
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4. Evidence



5. Unit Tests and Output

Assignment3.java

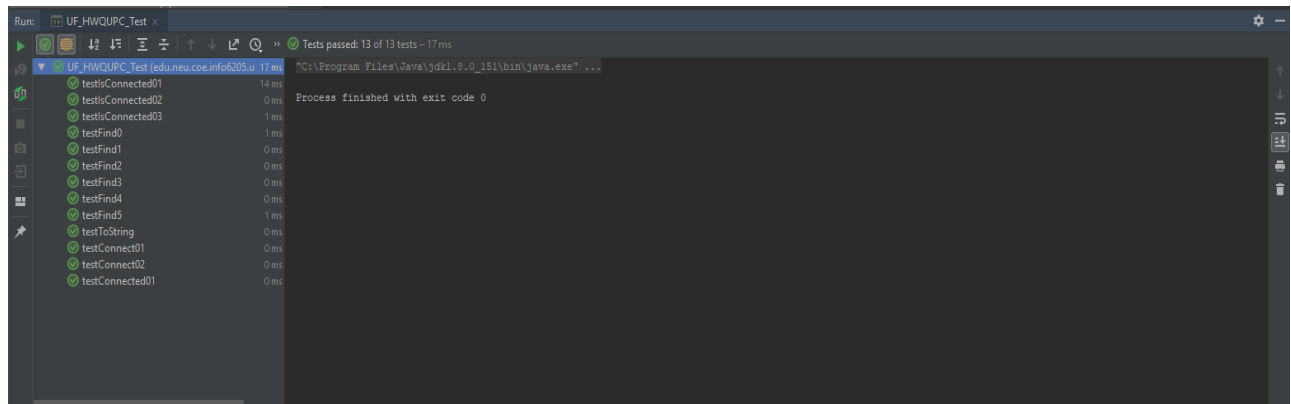


The screenshot shows the Run window for Assignment3.java. The output displays a series of calculations for different values of N, showing the number of pairs and the result of a function. The process finished with exit code 0.

```
Run: Assignment3 x Assignment3 x UF_HWQUPC_Test x
"C:\Program Files\Java\jdk1.8.0_151\bin\java.exe" "-javaagent:C:\Users\Wisha\AppData\Roaming\JetBrains\IntelliJ IDEA Community Edition 2018.2.5\lib\idea_rt.jar=1051:C:\Users\Wisha\AppData\Roaming\JetBrains\IntelliJ IDEA Community Edition 2018.2.5\bin" 1051
N = 100, Pairs = 261.4048, 1/2 N lg N = 230.25850929940458
N = 200, Pairs = 591.4932, 1/2 N lg N = 529.6317366548036
N = 400, Pairs = 1318.9742, 1/2 N lg N = 1199.2929094215963
N = 800, Pairs = 2904.8242, 1/2 N lg N = 2673.844691067171
N = 1600, Pairs = 6358.0227, 1/2 N lg N = 5902.207126582298
N = 3200, Pairs = 13873.8022, 1/2 N lg N = 12913.44974206051
N = 6400, Pairs = 29918.1905, 1/2 N lg N = 28044.97046191284
N = 12800, Pairs = 64165.9869, 1/2 N lg N = 60526.08287940933
N = 25600, Pairs = 137310.7046, 1/2 N lg N = 129924.44966998596
N = 51200, Pairs = 292531.3971, 1/2 N lg N = 277593.46716230654

Process finished with exit code 0
```

UF_HWQUPC.java



The screenshot shows the Run window for UF_HWQUPC.java. The output displays the results of 13 unit tests, all of which passed. The process finished with exit code 0.

```
Run: UF_HWQUPC_Test x
UF_HWQUPC_Test (edu.neu.coe.info6205.u.17 ms)
Tests passed: 13 of 13 tests - 17ms
"C:\Program Files\Java\jdk1.8.0_151\bin\java.exe" ...
testIsConnected01 14 ms
testIsConnected02 0 ms
testIsConnected03 1 ms
testFind0 1 ms
testFind1 0 ms
testFind2 0 ms
testFind3 0 ms
testFind4 0 ms
testFind5 1 ms
testToString 0 ms
testConnect01 0 ms
testConnect02 0 ms
testConnect03 0 ms

Process finished with exit code 0
```