Assignment 4

INFO6205 – Program Structure and Algorithms

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**Task**:

Benchmark weighted quick union, store the depth rather than the size, and PathCompression

Created Files:

WQUByDepth.java

UnionFindClient.java

UnionPathBenchmark.java

**Conclusions**:

After running the experiments of larger values of n like 10000, 20000, 30000 for 10 times randomly, Weighted quick union with path compression is the best option, but it does not have a constant time per operation. The weighted quick-union algorithm uses at most lg N array accesses to process M connections among N sites.

**Output/Observations:**

/Users/divyakulkarni/Library/Java/JavaVirtualMachines/openjdk-

For 10000 Elements

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

Weighted Quick Union by Depth 10 runs: 3.4

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

With Path Compression 10 runs: 2.7

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

Weighted Quick Union by Depth 20 runs: 2.45

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

With Path Compression 20 runs: 1.95

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

Weighted Quick Union by Depth 40 runs: 2.25

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

With Path Compression 40 runs: 1.525

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

Weighted Quick Union by Depth 80 runs: 2.15

2021-03-02 01:53:08 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

With Path Compression 80 runs: 1.5875

2021-03-02 01:53:09 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

Weighted Quick Union by Depth 160 runs: 2.21875

2021-03-02 01:53:09 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

With Path Compression 160 runs: 1.46875

2021-03-02 01:53:09 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

Weighted Quick Union by Depth 320 runs: 1.95625

2021-03-02 01:53:10 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

With Path Compression 320 runs: 1.484375

For 20000 Elements

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

Weighted Quick Union by Depth 10 runs: 5.4

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

With Path Compression 10 runs: 4.2

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

Weighted Quick Union by Depth 20 runs: 5.15

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

With Path Compression 20 runs: 3.3

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

Weighted Quick Union by Depth 40 runs: 4.775

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

With Path Compression 40 runs: 3.425

2021-03-02 11:12:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

Weighted Quick Union by Depth 80 runs: 4.6875

2021-03-02 11:12:16 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

With Path Compression 80 runs: 3.2

2021-03-02 11:12:16 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

Weighted Quick Union by Depth 160 runs: 4.5875

2021-03-02 11:12:17 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

With Path Compression 160 runs: 3.25

2021-03-02 11:12:17 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

Weighted Quick Union by Depth 320 runs: 4.3125

2021-03-02 11:12:19 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

With Path Compression 320 runs: 2.9875

Process finished with exit code 0

For 30000 Elements

/Users/divyakulkarni/Library/Java/JavaVirtualMachines/openjdk-

2021-03-02 11:15:12 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

Weighted Quick Union by Depth 10 runs: 10.0

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 10 runs

With Path Compression 10 runs: 7.0

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

Weighted Quick Union by Depth 20 runs: 8.8

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 20 runs

With Path Compression 20 runs: 5.5

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

Weighted Quick Union by Depth 40 runs: 8.225

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 40 runs

With Path Compression 40 runs: 4.825

2021-03-02 11:15:13 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

Weighted Quick Union by Depth 80 runs: 7.55

2021-03-02 11:15:14 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 80 runs

With Path Compression 80 runs: 5.1625

2021-03-02 11:15:15 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

Weighted Quick Union by Depth 160 runs: 7.50625

2021-03-02 11:15:16 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 160 runs

With Path Compression 160 runs: 5.34375

2021-03-02 11:15:17 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

Weighted Quick Union by Depth 320 runs: 7.25

2021-03-02 11:15:19 INFO Benchmark\_Timer - Begin run: testWaitPeriods with 320 runs

With Path Compression 320 runs: 5.053125

Process finished with exit code 0