

Conner Thomas

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CSE 373

#### Homework 4

1. The worst case running time for union is  $O(1)$ . It only has to check an equality, then make an addition and set a pointer.
2. The method find() is only  $O(\log n)$  in the worst case. The upree created by the union find set is never going to be more than  $\log n$  tall, and after find it is even smaller since my find() implements path compression through recursion.
3. I used the testfile included to test my implementation. If the disjoint set is working correctly, then only 1 number will repeatedly appear on each line, since the program unions the sets with the same number, then multiplies it by 2 and adds 16 to it for the next pair of lines.
4. I did not work with a partner.
5. A 1000x1000 would take a very long time to generate. Just attempting to do so on my computer made it lag considerably, and I noticed that the java service running was drawing over 30% of my CPU power while computing. I think that's an unreasonable amount of time. I believe that the most time costly part of the program is the edge generation, as it has to iterate through every single cell and run at least 2 operations on each one. This means that it would have to run through 1,000,000 cells for this maze. If I could make this more streamlined, or find a better function to use to generate these edges, it would be faster. A change that would slow it down even further would be if I wanted to do a sanity check on the edge list to make sure none are repeated.