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INFO 6205 Program Structures and Algorithms

Section 8

Assignment 3

Github Link: https://github.com/Varma-PA/INFO6205

Tasks:

* Implemented the following functions in UF\_HWQUPC.java : “find”, “mergeComponents”and “doPathCompression”
* Implemented the client to take the input of number of sites and find the number of connections made in total.
* Deducing the relationship between number of sites and the connections count

Relationship:

M = (N \* log (N)) / 2

Where M = Connection Count, N = Sites

Output:

Step 1:

Successfully implemented the incomplete functions inside of UF\_HWQUPC.java and executed all the test cases.

Text

Description automatically generated

Step 2:

Created UnionFind.java to implement the UF\_HWQUPC.java function. Gave the input which is gradually increasing exponentially and counted the number of connections made.   
  
  
  
This is the output that I got  
  
Text

Description automatically generated  
  
  
Note:   
UnionFind.java can be found in the same directory where UF\_HWQUPC.java file is written.

Step 3:

Here we have Sites v/s connections graph

|  |  |  |  |
| --- | --- | --- | --- |
| Sites | log N | N \* Log N | (N \* Log N) / 2 |
| 1000 | 9.96578428 | 9965.78428 | 4982.892142 |
| 2000 | 10.9657843 | 21931.5686 | 10965.78428 |
| 4000 | 11.9657843 | 47863.1371 | 23931.56857 |
| 8000 | 12.9657843 | 103726.274 | 51863.13714 |
| 16000 | 13.9657843 | 223452.549 | 111726.2743 |
| 32000 | 14.9657843 | 478905.097 | 239452.5486 |
| 64000 | 15.9657843 | 1021810.19 | 510905.0971 |

From the above two graphs, we can observe that the graphs between Sites v/s Connections and the Sites v/s N \* Log(N) / 2 are similar in shape.

Hence the relation should be M = (N \* Log(N)) / 2

Where M = Connection Count and N = Sites