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6205 - Program Structures and Algorithms

Assignment - 3

Problem Statement:

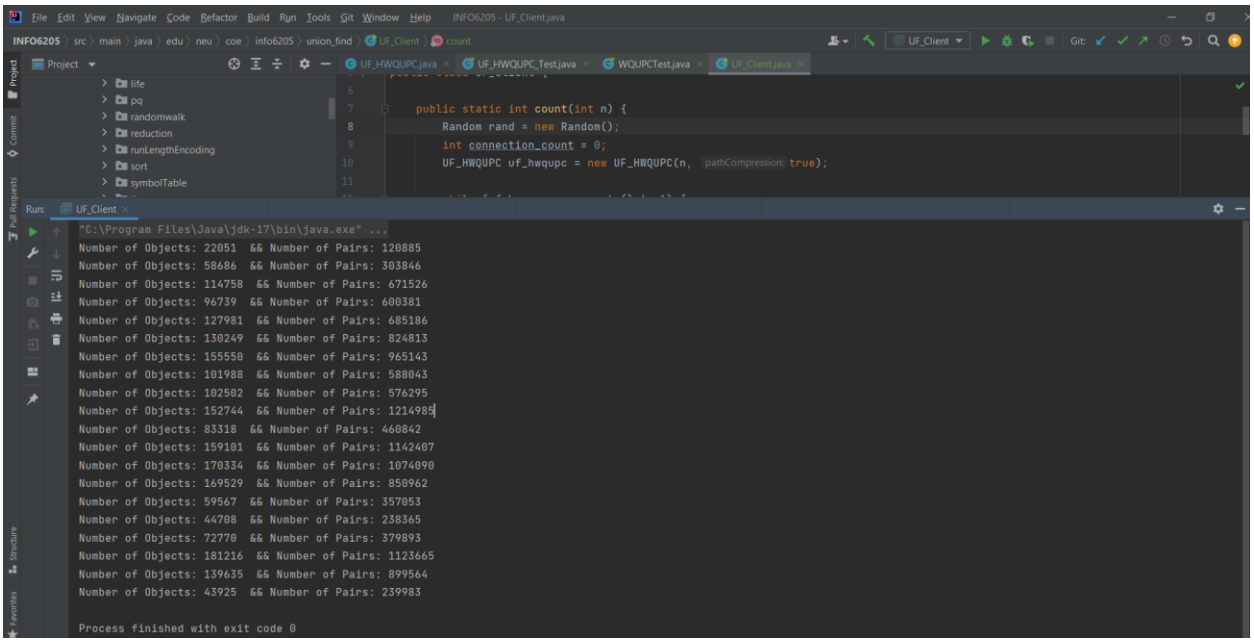
To implement height-weighted Quick Union with path compression. For this task UF_HWQUPC java class was used and methods that were implemented:

1. find ()
2. mergeComponents ()
3. doPathCompression ()

A new class UF_Client was implemented.

Output:

UF_Client main () ran successfully. It ran for 20 times, printing following output in console.



Console Output:

Number of Objects: 22051 && Number of Pairs: 120885

Number of Objects: 58686 && Number of Pairs: 303846

Number of Objects: 114758 && Number of Pairs: 671526

Number of Objects: 96739 && Number of Pairs: 600381

Number of Objects: 127981 && Number of Pairs: 685186

Number of Objects: 130249 && Number of Pairs: 824813

Number of Objects: 155550 && Number of Pairs: 965143

Number of Objects: 101988 && Number of Pairs: 588043

Number of Objects: 102502 && Number of Pairs: 576295

Number of Objects: 152744 && Number of Pairs: 1214985

Number of Objects: 83318 && Number of Pairs: 460842

Number of Objects: 159101 && Number of Pairs: 1142407

Number of Objects: 170334 && Number of Pairs: 1074090

Number of Objects: 169529 && Number of Pairs: 850962

Number of Objects: 59567 && Number of Pairs: 357053

Number of Objects: 44708 && Number of Pairs: 238365

Number of Objects: 72770 && Number of Pairs: 379893

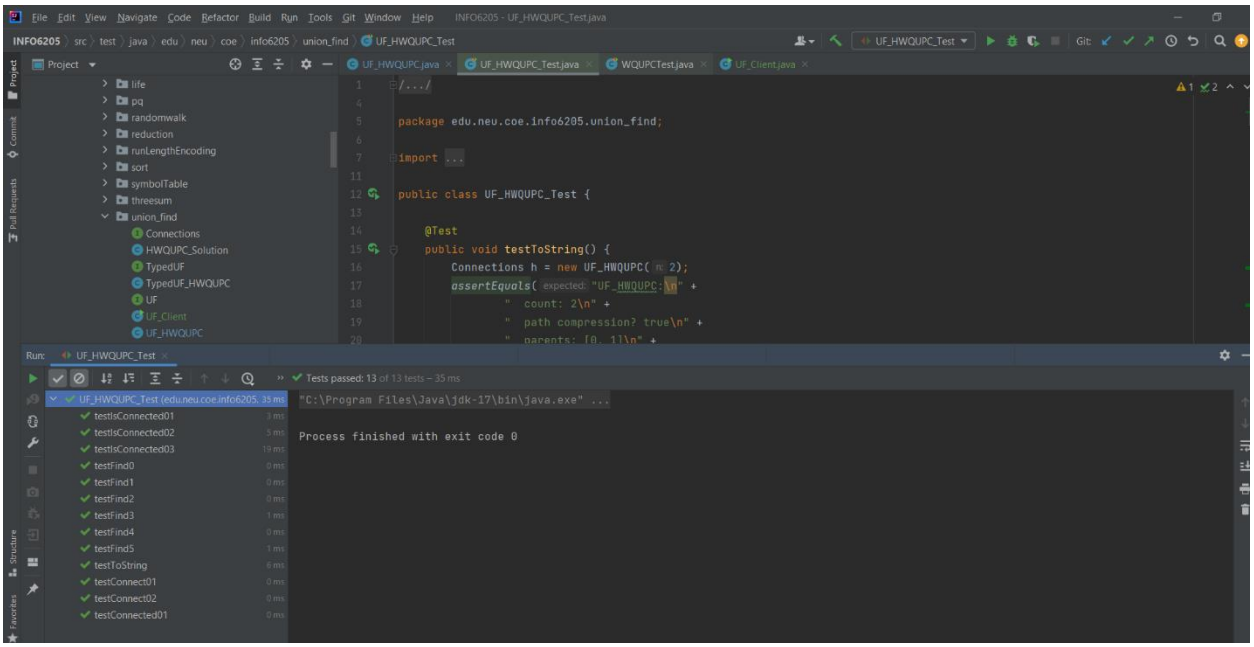
Number of Objects: 181216 && Number of Pairs: 1123665

Number of Objects: 139635 && Number of Pairs: 899564

Number of Objects: 43925 && Number of Pairs: 239983

Test Case Results:

UF_HWQUPC.java ran successfully, passing all tests.



Deduction:

After reviewing results of the following experiment, it can be concluded that:

Number of Pairs (m) generated is directly proportional to the Number of Objects (n) that are provided as input i.e.

m ~ 6*n

Practical Evidence:

Following table depict the relationship between the number of objects(n) and the number of pairs(m) generated when ran 20 times with randomly selected values of n.

Index	Number of Objects (n)	Number of Pairs (m)
1	22051	120885
2	58686	303846
3	114758	671526
4	96739	600381
5	127981	685186
6	130249	824813
7	155550	965143
8	101988	588043
9	102502	576295
10	152744	1214985
11	83318	460842
12	159101	1142407
13	170334	1074090
14	169529	850962
15	59567	357053
16	44708	238365
17	72770	379893
18	181216	1123665
19	139635	899564
20	43925	239983

Charts:

The same relationship can be depicted using the following chart plotted below.

Logarithmic Chart