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Assignment 3 - Height-weighted Quick Union with Path Compression.

1. Code ->

<https://github.com/RipanHalder/INFO6205>

Assignment3 Part 1 & 2 -> /src/main/java/edu/neu/coe/info6205/union_find/UF_HWQUPC.java

Results -> results/union_find/assignment3.csv

2. Screenshots and Evidences:

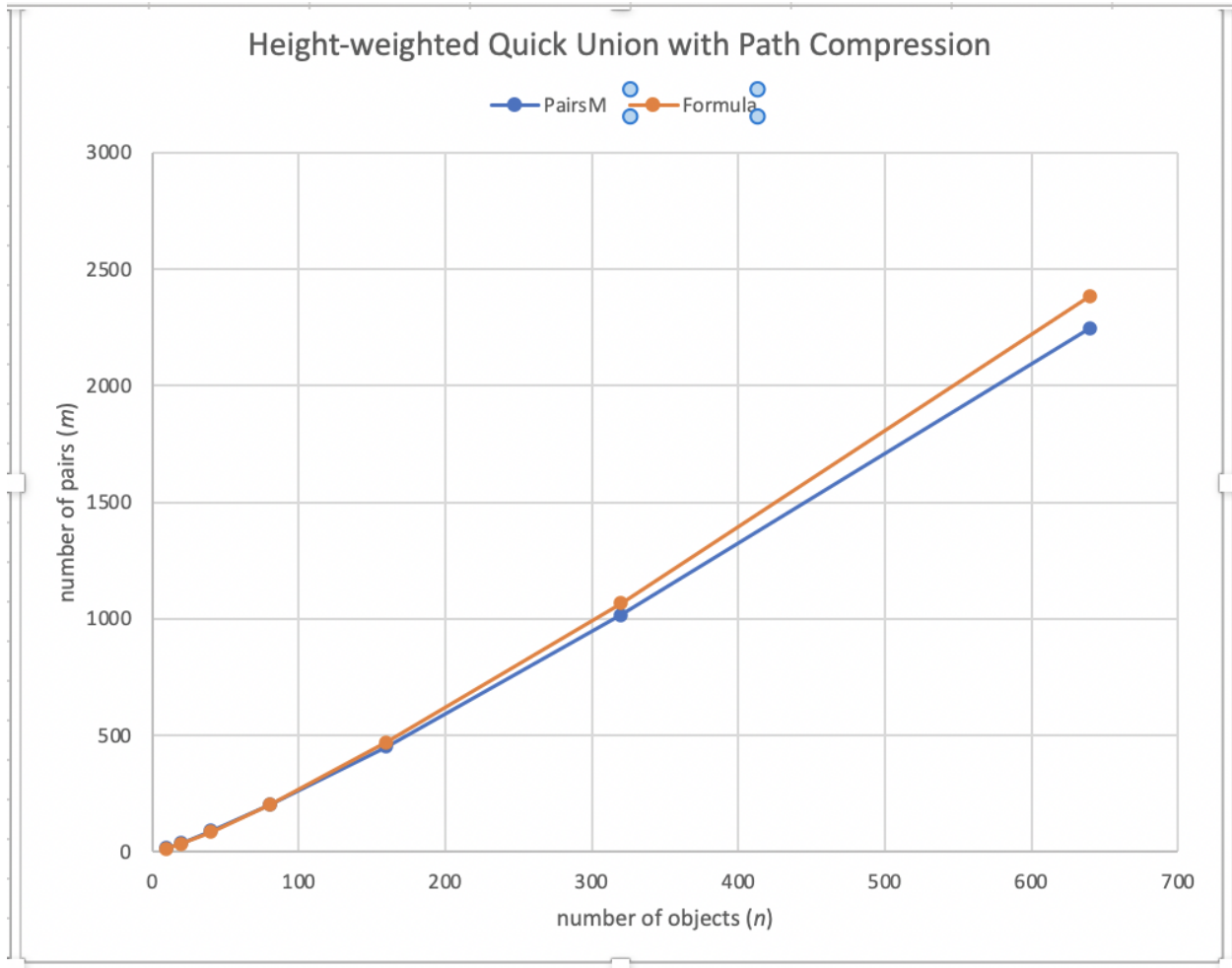
I ran the code for various values of n ranging from 10 – 640. The pairs generated are mean of 1000 successful runs.

The following table shows the relationship between the number of objects (n) and the number of pairs (m) generated to accomplish this (i.e. to reduce the number of components from n to 1).
















number of objects (n)	number of pairs (m)	Formula
10	16	13.28771238
20	37	34.57542476
40	89	85.15084952
80	201	202.301699
160	452	468.6033981
320	1017	1065.206796
640	2247	2386.413592

Formula = $\alpha * N * \log_2 N$
(where $\alpha \sim 0.4$)

At first, I derived to formula by checking the trend which was logarithmic for ranging values of n . The above results of pairs were derived for every n for 1000 runs each. The final M pairs are an average of these 1000 runs. After getting the logarithmic observation it was necessary to find the factor multiplying $\log N$. There was a constant co-efficient α multiplied with $N \log 2N$. After further analysis, I deduced it to be around $\alpha = \sim 0.4$. For better understanding see the below chart:



Unit Test Cases - Successful Run:

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- ▼  edu.neu.coe.info6205.union_find.UF_HWQUPC_Test [Run]
-  testIsConnected01 (0.002 s)
 -  testIsConnected02 (0.000 s)
 -  testIsConnected03 (0.002 s)
 -  testFind0 (0.000 s)
 -  testFind1 (0.001 s)
 -  testFind2 (0.000 s)
 -  testFind3 (0.000 s)
 -  testFind4 (0.000 s)
 -  testFind5 (0.000 s)
 -  testToString (0.001 s)
 -  testConnect01 (0.000 s)
 -  testConnect02 (0.000 s)
 -  testConnected01 (0.004 s)