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Program Structures & Algorithms Fall 2021

Assignment No. 03

Task:

• Implemented height-weighted Quick Union with Path Compression and check that the all the unit tests pass

• Using the implementation of UF_HWQUPC, determined the number of connection pairs for the given number objects (n)

• Determined the relationship between the number of objects (*n*) and the number of connection pairs (*m*) generated.

Relationship Conclusion:

After performing a series of experiments by passing different values of n (1000,2000,3000,4000,5000), it is evident that the number of pairs generated (m) is related to (n) as

$$m \approx (½)\ n.\ln(n)$$

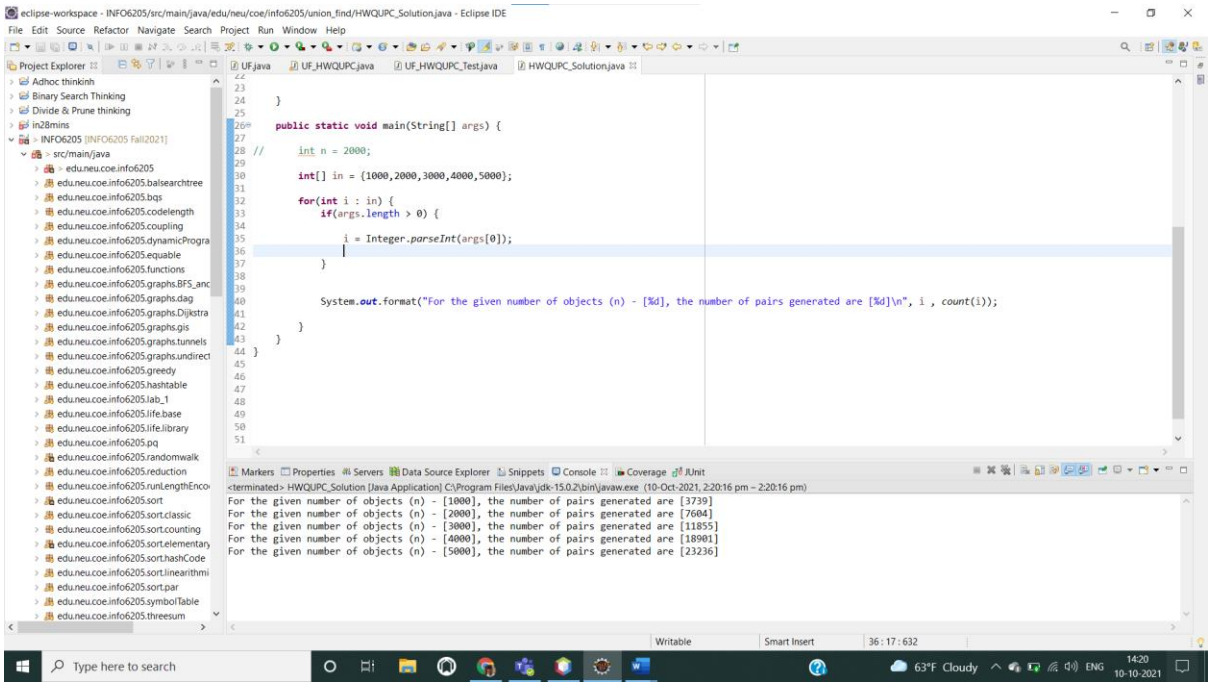
Findings:

Number of Objects (n)	Pairs Generated (m)	value of (½)n.ln(n)
1000	3739	3453
2000	7604	7600
3000	11855	12009
4000	18901	17588
5000	23236	21292

```
For the given number of objects (n) - [1000], the number of pairs generated are
[3739]
For the given number of objects (n) - [2000], the number of pairs generated are
[7604]
For the given number of objects (n) - [3000], the number of pairs generated are
[11855]
For the given number of objects (n) - [4000], the number of pairs generated are
[18901]

For the given number of objects (n) - [5000], the number of pairs generated are
[23236]
```

Output Screenshot:




```
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[18901]

For the given number of objects (n) - [5000], the number of pairs generated are
[23236]
```
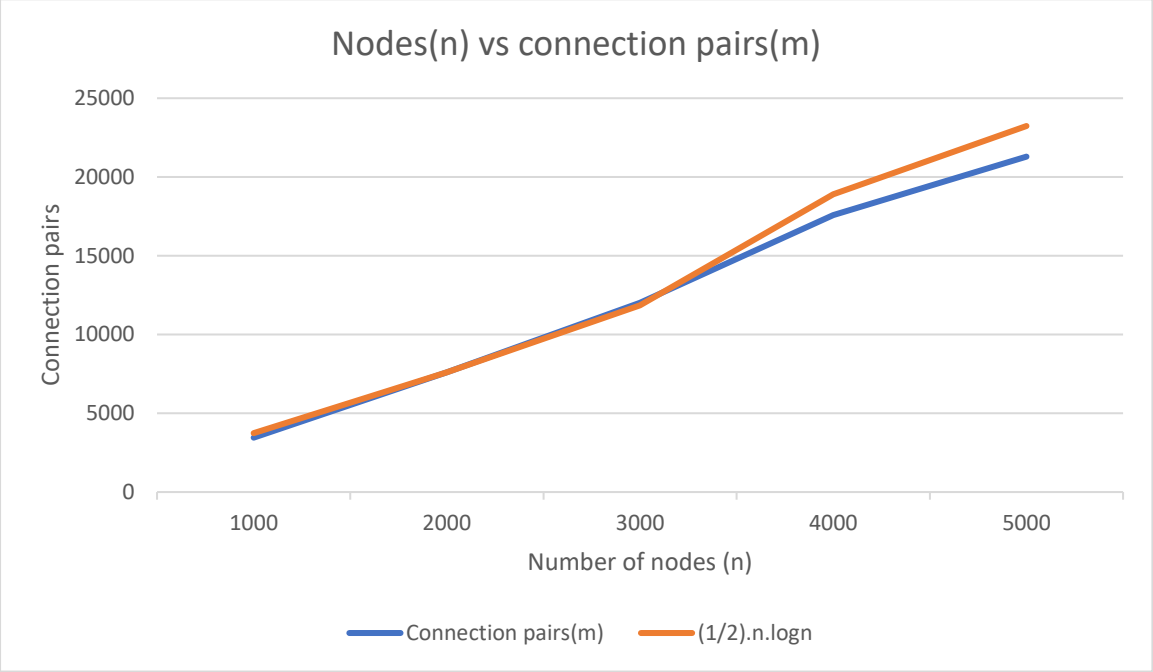

Graph representation to build relation between (n) and (m):



Unit Test Screenshot: