

Aishwarya Ajit Deshpande - NUID 001003135

# Program Structures & Algorithms

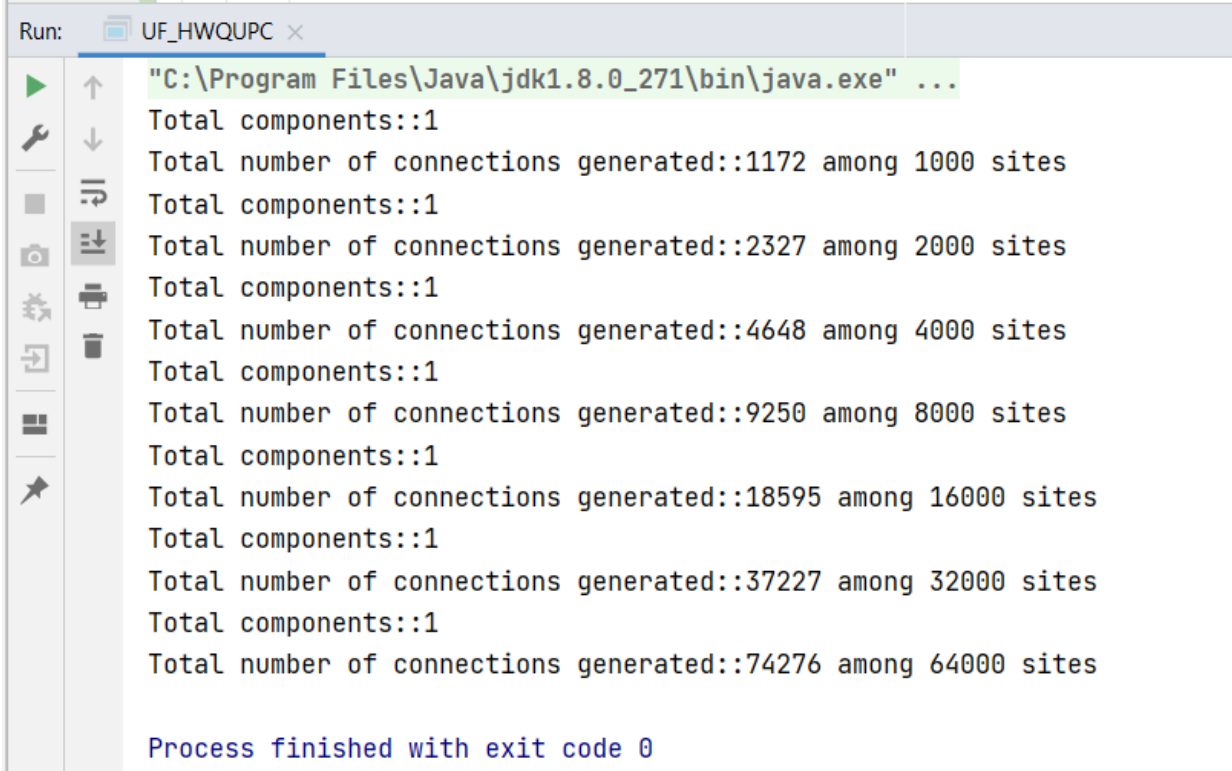
## Spring 2021

### Assignment No. 03

- **Task**

1. To implement height-weighted Quick Union with Path Compression.
2. To develop a UF client which generates random pairs of integers between 0 and n-1, calling connected() to determine if they are connected and union() if not. Loop until all sites are connected then print the number of connections generated.
3. To determine 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).

- **Output**



```
Run: UF_HWQUPC x
"C:\Program Files\Java\jdk1.8.0_271\bin\java.exe" ...
Total components::1
Total number of connections generated::1172 among 1000 sites
Total components::1
Total number of connections generated::2327 among 2000 sites
Total components::1
Total number of connections generated::4648 among 4000 sites
Total components::1
Total number of connections generated::9250 among 8000 sites
Total components::1
Total number of connections generated::18595 among 16000 sites
Total components::1
Total number of connections generated::37227 among 32000 sites
Total components::1
Total number of connections generated::74276 among 64000 sites

Process finished with exit code 0
```

- **Conclusion:**

It is observed that the relation between number of sites(n) and the total pairs(m) generated:  
n is directly proportional to m.

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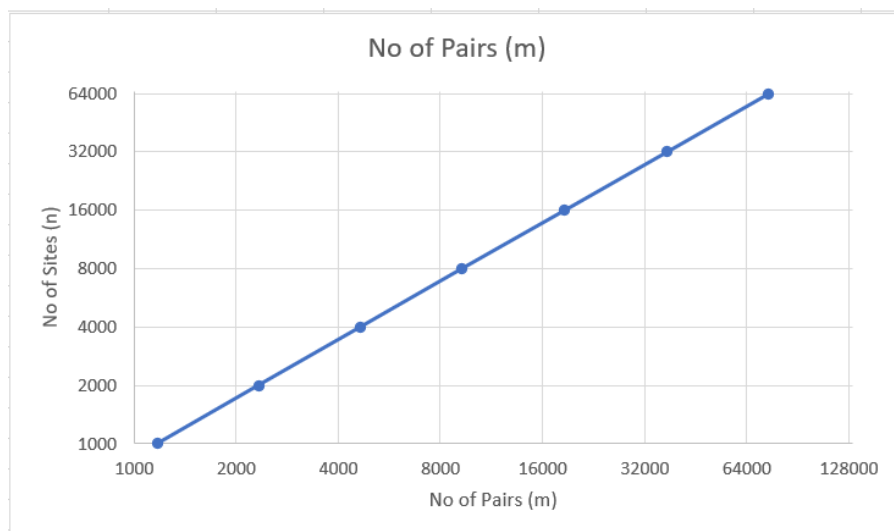
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- Evidence to support conclusion and Graphical Representation:

	A	B
1	No of Sites (n)	No of Pairs (m)
2	1000	1172
3	2000	2327
4	4000	4648
5	8000	9250
6	16000	18595
7	32000	37227
8	64000	74276



- Unit test results:

Passed all test cases.

