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INFO 6205

Program Structures & Algorithms

Fall 2020

Assignment No3

Note: the client main function is in the package named UF_HWQUPC_Client

1. Task:

Using your implementation of UF_HWQUPC, develop a UF ("union-find") client that takes an integer value n from the command line to determine the number of "sites." Then 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. Package your program as a static method `count()` that takes n as the argument and returns the number of connections; and a `main()` that takes n from the command line, calls `count()` and prints the returned value. If you prefer, you can create a main program that doesn't require any input and runs the experiment for a fixed set of n values. Show evidence of your run(s). 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).

2. Output:

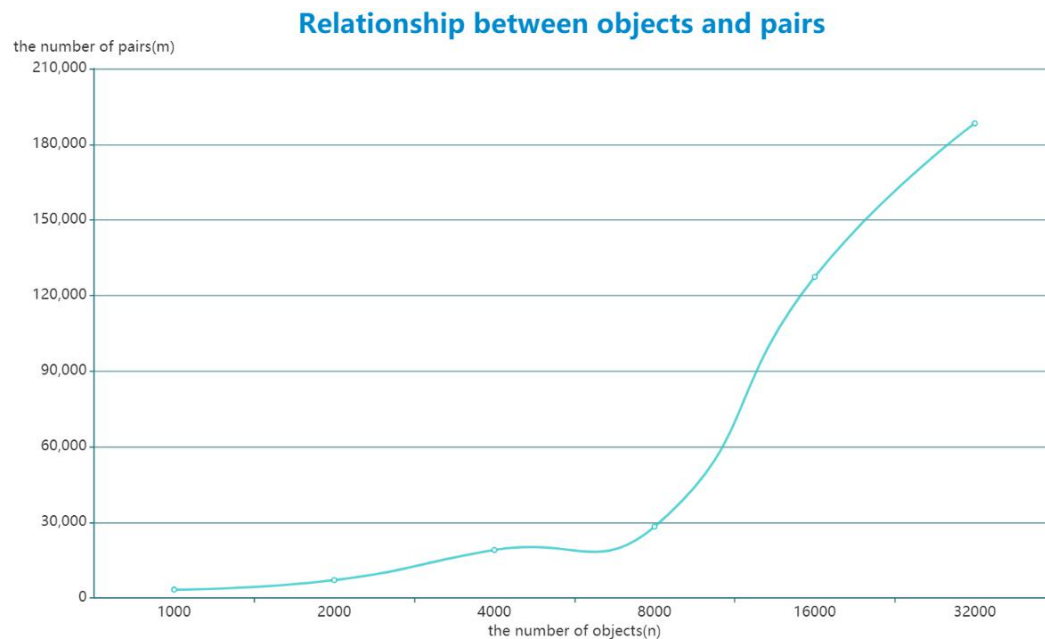
```
D:\Java\jdk\bin\java.exe "-javaagent:D:\intelliJ
Please input the size of sites:1000
the number of pairs is: 3318
the number of connections happening is: 3313
Please input the size of sites:2000
the number of pairs is: 7078
the number of connections happening is: 7075
Please input the size of sites:4000
the number of pairs is: 19057
the number of connections happening is: 19051
Please input the size of sites:8000
the number of pairs is: 28284
the number of connections happening is: 28279
Please input the size of sites:16000
the number of pairs is: 127373
the number of connections happening is: 127369
Please input the size of sites:32000
the number of pairs is: 188299
the number of connections happening is: 188295

Process finished with exit code 0
```

3. Relationship conclusion:

It can be observed that the number of pairs will increase with the growth of the size of objects, especially, it shows a gradually dramatic surge.

4. Evidence to support relationship:



5. Screenshot of Unit test passing:

▼ ✓ UF_HWQUPC_Test (edu.neu.coe.info6; 7 ms)		
✓ testIsConnected01		3 ms
✓ testIsConnected02		1 ms
✓ testIsConnected03		2 ms
✓ testFind0		0 ms
✓ testFind1		0 ms
✓ testFind2		0 ms
✓ testFind3		1 ms
✓ testFind4		0 ms
✓ testFind5		0 ms
✓ testToString		0 ms
✓ testConnect01		0 ms
✓ testConnect02		0 ms
✓ testConnected01		0 ms