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Program Structure and Algorithms 6205 Section 6.

ASSIGNMENT 3

Task: - In this assignment we are writing code for union find data structure where we try to find the root of any given component and a function to connect components. What different we are doing in this assignment is that we are using path compression to join two components by directly attaching the child node to the grandparent(root). We are using height of the component to decide which components joins which. Finally we are running a main program to find the relation between the number of sites and the number of pairs generated.

Test Cases: -

Graphical user interface, text, application

Description automatically generated

Outputs of the main program written in UF\_HWQUPC.java: -

When N is 250:-

Graphical user interface, application

Description automatically generated

When N is 500:-

Graphical user interface, application

Description automatically generated

When N is 750:-

Graphical user interface, application

Description automatically generated

When N is 1250: -

Graphical user interface, text, application

Description automatically generated

When N is 1500: -

Graphical user interface, text, application

Description automatically generated

|  |  |  |
| --- | --- | --- |
| Number of Steps (n) | Predicted(M) | Expected(M) |
| 250 | 818 | 690 |
| 500 | 1667 | 1553 |
| 750 | 2488 | 2482 |
| 1000 | 3319 | 3453 |
| 1250 | 4747 | 4456 |
| 1500 | 5797 | 5484 |

Plotting these values in the table and then on the graph.

Relation Conclusion: - **M = (1/2) N ln N**

**(Where N = Number of Sites**

And **M** = is the number of all pairs generated)

Evidence:- the number of pairs generated that are predicted by the height weight union find program is approximately equal to half the number of sites multiplied by natural log of N.