Mohit Negi (001549103)

Program Structures & Algorithms

Fall 2021

Assignment No. 3

- **Task (List down the tasks performed in the Assignment)**
  - **UF_HWQUPC class:**
    - Implemented find, mergeComponents and doPathCompression functions.
    - Performing path compression on the branches not connected to the root branch to produce amortized time performance { **α(n)** }.

  - **UF_Client class:**
    - Added the main function to loop over a predefined number of sites and find the connections made over 10 tries. Then printing the average (count/10).
    - Implemented a count function to return the number of the connections made.
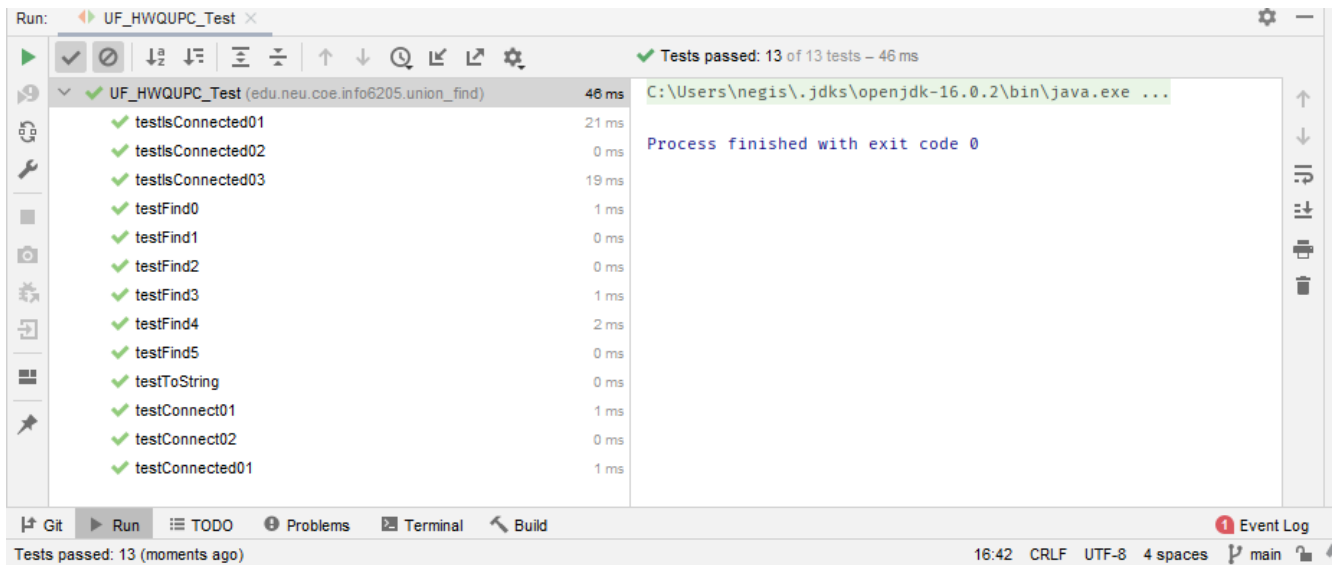
- **Output & Unit test results:**

Fig.1: UF_HWQUPC Test

Fig.2: UF_Client Result

Observation:

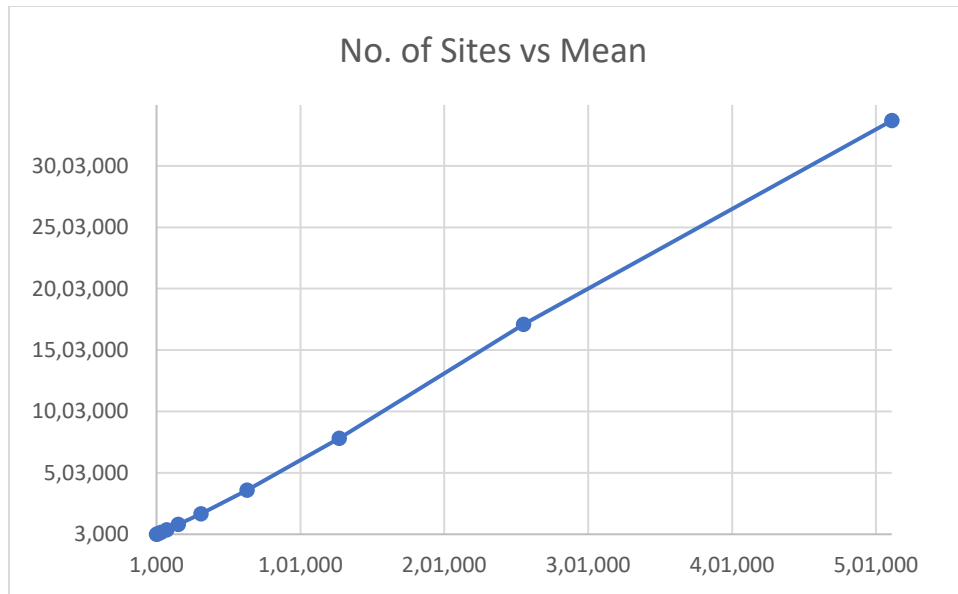| No. of Sites	Mean	R= (n* ln(n)) /2
1,000	3,791	3,453
2,000	8,413	7,600
4,000	17,486	16,588
8,000	39,700	35,948
16,000	82,801	77,442
32,000	1,69,692	1,65,975
64,000	3,61,227	3,54,132
1,28,000	7,85,009	7,52,626
2,56,000	17,12,114	15,93,975
5,12,000	33,71,837	33,65,396

Table. 1: UF_Client Result
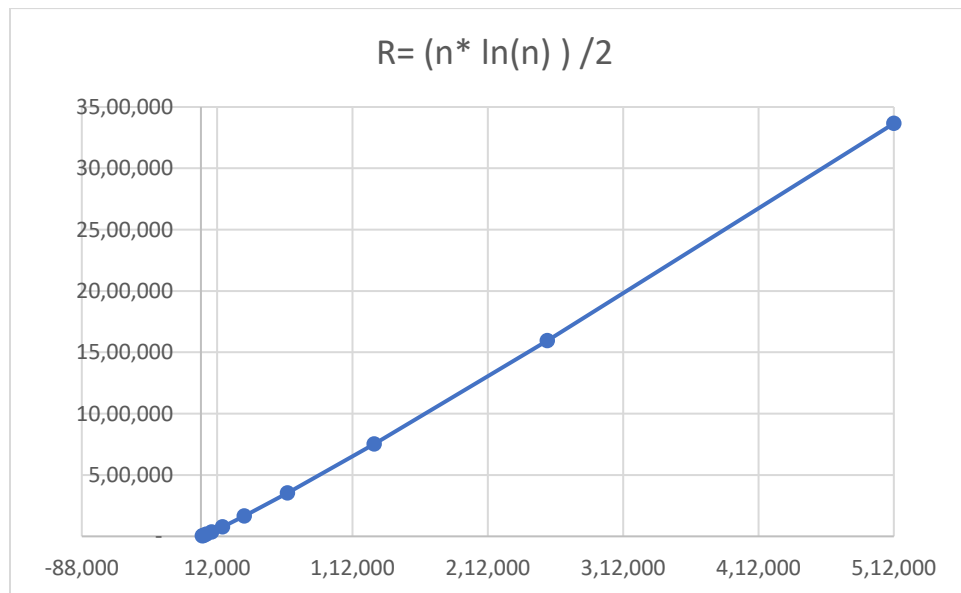
Fig.3: No. of Sites vs Mean Result

Fig.4: Relation Plot

From the above table we can infer the following:

- From the above two figure (Fig.3 & Fig.4) we can confirm that the relation that we inferred is true.

    Relation:

    R= (n* ln(n)) /2
    Where R = Connection, n = No. of sites