Program Structures and Algorithms

Spring 2023(SEC –03)

NAME:ALTAF SALIM SHAIKH

NUID:002774748

**Task:**

* Implement height-weighted Quick Union with Path Compression
* Develop a UF ("union-find") client that takes an integer value n from the command line to determine the number of "sites."
* Determine the relationship between the number of objects (n) and the number of pairs (m) generated

Step 1: UF\_HWQUPC implementation snippets  
**Graphical user interface, text, application, email

Description automatically generated  
Graphical user interface, text, application

Description automatically generated**

Graphical user interface, text, application

Description automatically generated

Step 2: UF Client implementation  
  
Text

Description automatically generated  
  
Table

Description automatically generated  
Table

Description automatically generated **Relationship Conclusion:**

The correlation between "n" and "m" can be estimated using the equation "fn = 0.5 \* n \* ln(n)". "m" represents the number of connections needed to connect all the elements in a union find data structure, while "n" represents the number of elements in the data structure.   
  
The relationship between "n" and "m" can be viewed as **logarithmic**, meaning that as the number of elements "n" increases, the number of connections "m" required also increases, but at a slower pace. The offset value shows how close the value of "m" is to the calculated value "fn", with a positive offset indicating that "m" is greater than "fn" and a negative offset indicating that "m" is less than "fn".