Danlin Lu (001567176)

**Program Structures & Algorithms**

**Fall 2021**

**Assignment No. 3**

* **Task**

**There are three parts of overall tasks:**

1. **Implement height-weighted Quick Union with Path Compression and check the unit tests.**
2. **Use 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 the 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. Show evidence of the run(s)**
3. **Determine the relationship between the number of objects (*n*) and the number of pairs (*m*) generated to accomplish this.**

* **Relationship Conclusion:**

1. **The relationship between N and M is linear.**
2. **The observed line approaches . So, I think the relationship between two variables is .**

* **Evidence to support the conclusion:**

1. **Output**

**图形用户界面, 应用程序

描述已自动生成N is set from 100 to 20000 where the interval is 50, thus there are total 399 returned values. As it’s hard to show all of 399 values here, only head and tail are shown up. For details, please check Assignment 3 result.xlsx within the Assignment 3 file.**

**图形用户界面, 文本, 应用程序

描述已自动生成**

1. **Graphical Representation**

**The graph observed with samples (details are in Assignment 3 result.xlsx):**

|  |  |  |
| --- | --- | --- |
| N | Num of Pairs | 1/2Nln(N) |
| 2050 | 8485 | 7816.23495 |
| 2100 | 8138 | 8032.17725 |
| 2150 | 8636 | 8248.71486 |
| 2200 | 9023 | 8465.8339 |

**图表, 折线图

描述已自动生成**

* **Unit tests result:**

图形用户界面, 文本, 应用程序

描述已自动生成**UF\_HWQUPC\_Test are passed and none of code is modified:**

图形用户界面, 文本, 应用程序

描述已自动生成图形用户界面

中度可信度描述已自动生成

图形用户界面, 应用程序

描述已自动生成图形用户界面, 文本, 应用程序

描述已自动生成