**INFO 6205**

**Program Structures & Algorithms**

**Summer Full 2018**

**Assignment 2**

A union-find algorithm is an algorithm that performs two useful operations on such a data structure:

***Find:*** Determine which subset a particular element is in. This can be used for determining if two elements are in the same subset.

***Union:*** Join two subsets into a single subset.

Union-Find Algorithm can be used to check whether an undirected graph contains cycle or not or it can be used to connect the unconnected objects.

In this assignment, I ran the experiment for various steps to note or deduce any useful expression out of it.

1. **CONCLUSION:**

Some useful abbreviations:

* n – Number of objects taken in the starting to connect.

Expression given below for reducing the number of components from n to 1:

**Number of pairs generated ~ ½ n log n**

**Where log is natural logarithm**

I ran the experiment for various “n” like20,40,80,160,320 etc. While doing the experiment, the mean pairs that were calculated each time for n which also ran in an incremental manner.

Experiments taken: 20 time.

Steps Increased **20** in each iteration of the experiment.

I have repeated it for 14 n’s.

1. Graph of various n’s is given below:



Please find the screenshot of the values below:



Let’s take an example to prove the equation:

**Example 1:**

Take n **=** 10

In the screenshot, when I have taken:

Experiments: 1

According to equation:

**Pairs generated to connect(pairs) ~ ½ n log n**

n = 10

pairs = ½\*10\*log 10

pairs = 5\*2.302585

pairs = 11.51292546

Pairs through code = 14

Pairs through the equation = 11.51292546

Both are almost same as we are taking the approximate amount, so it is equal.

**Example 2:**

Take n **=** 20

In the screenshot, when I have taken:

Experiments: 21

According to equation:

**Pairs generated to connect(pairs) ~ ½ n log n**

n = 20

pairs = ½\*20\*log 20

pairs = 10\*2.995732

pairs = 29.95732

Pairs through code = 38

Pairs through the equation = 29.95732

Both are almost same as we are taking the approximate amount, so it is equal.

**Hence Proved**