XINYI WU (001529267)

Program Structures & Algorithms

Spring 2021 Assignment No. 2

Task:

Determine the relationship between the number of objects(n) and the number of pairs(m) generated to accomplish this(i.e. to reduce the number of components from n to 1).

Output:

- Data points
  - `/INF06205/Python/src/union_find/stats.csv`

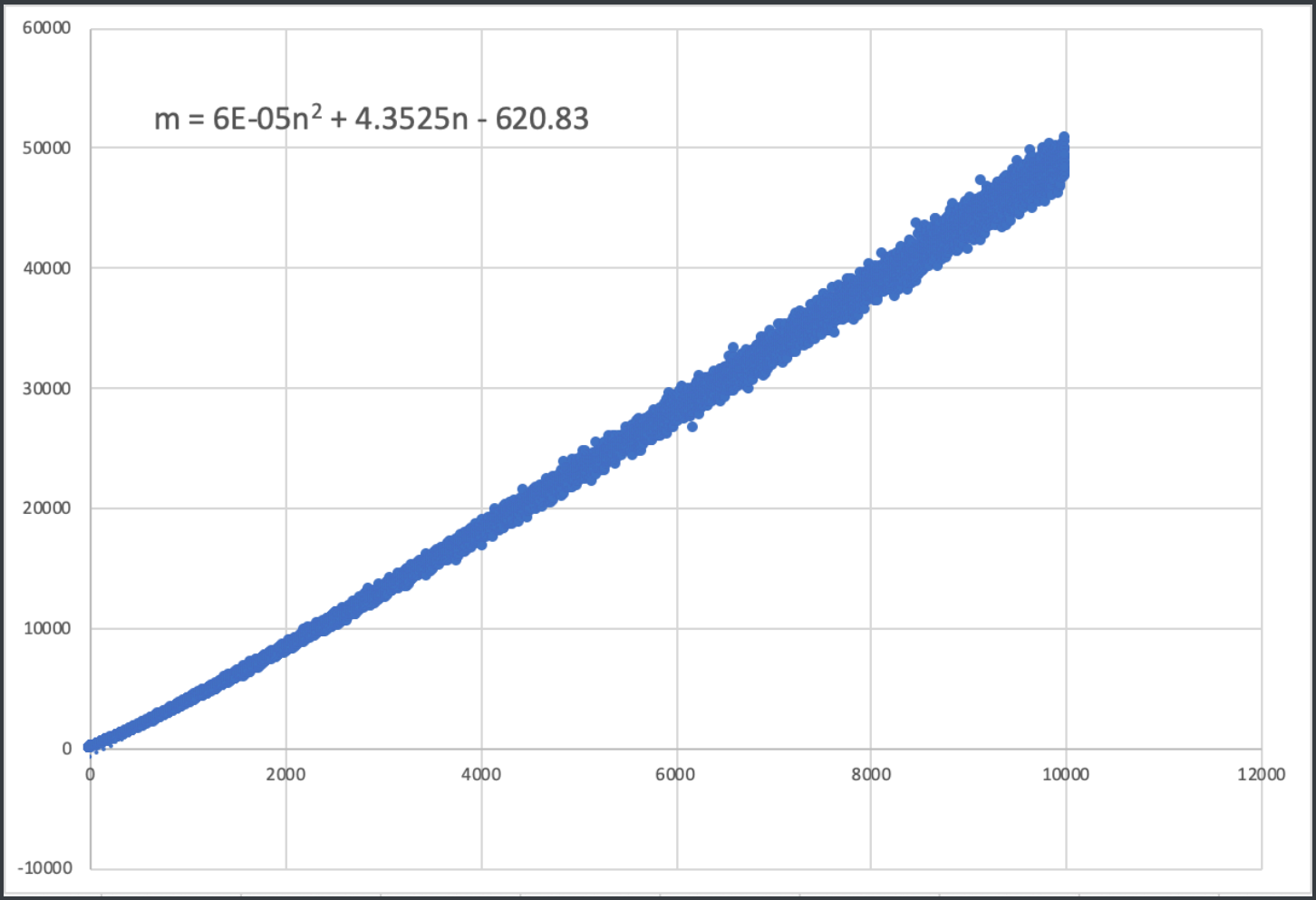
Relationship Conclusion:

When the number of objects(n) gets larger, the number of pairs(m) gets larger. In general, the relationship between the number of objects(n) and the number of pairs(m) is roughly like **m = 6E-05n^2 + 4.3525n - 620.83**

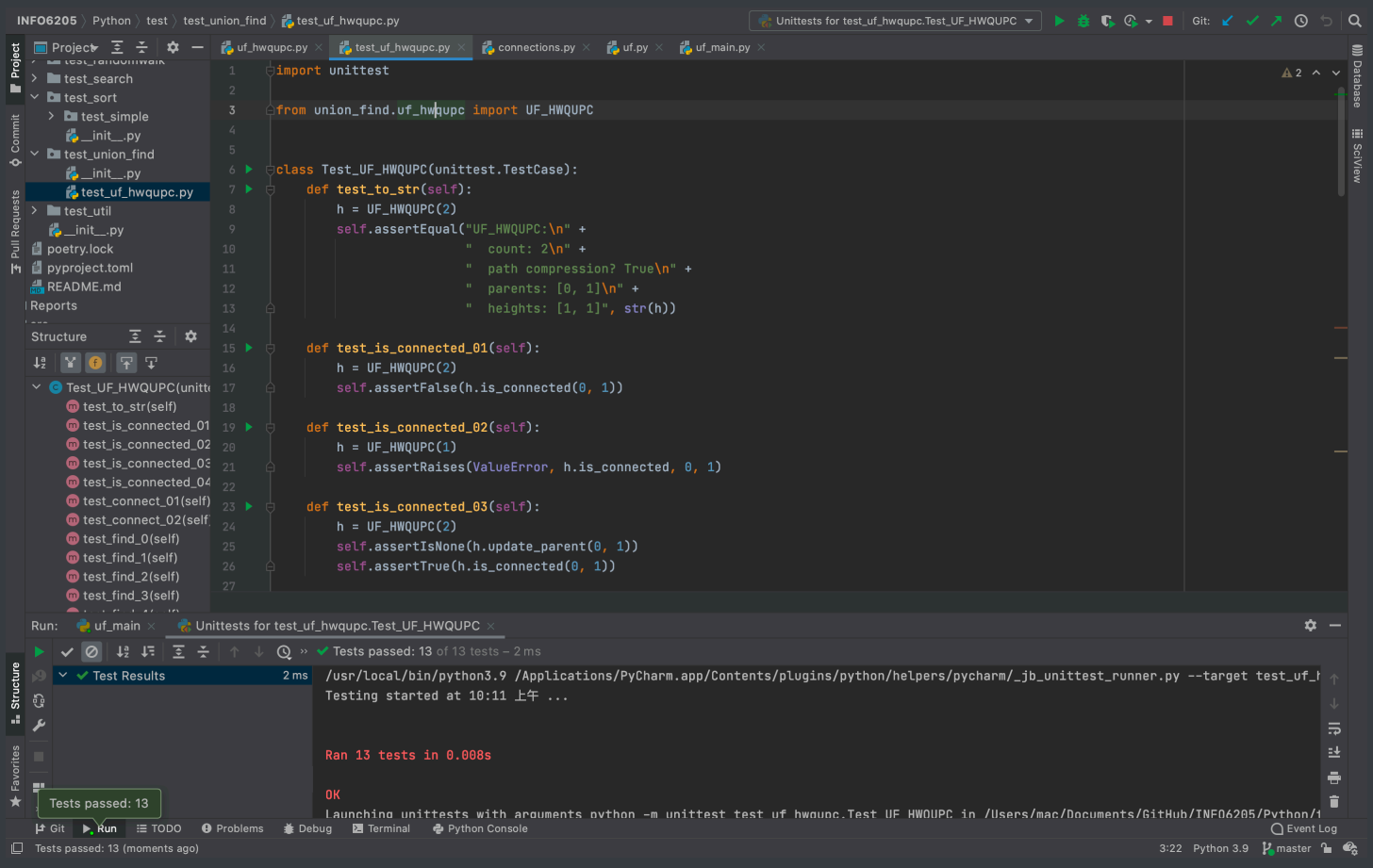
Evidence to support the conclusion:

According to the output, if we just calculate the number of pairs which are getting connected through union, **m=n-1**. If we count all the list of pairs generated, when n = 10000, **m≈4.3525n**. It is a linear relationship.

Graphical representation:



Unit tests result:


INFO6205 Python test test_union_find test_uf_hwqupc.py
Unittests for test_uf_hwqupc.Test_UF_HWQUPC
Git:
Project
uf_hwqupc.py
test_uf_hwqupc.py
connections.py
uf.py
uf_main.py
test_search
test_sort
test_simple
__init__.py
test_union_find
__init__.py
test_uf_hwqupc.py
test_util
__init__.py
poetry.lock
pyproject.toml
README.md
Reports
Structure
Test_UF_HWQUPC(unitte
test_to_str(self)
test_is_connected_01
test_is_connected_02
test_is_connected_03
test_is_connected_04
test_connect_01(self)
test_connect_02(self)
test_find_0(self)
test_find_1(self)
test_find_2(self)
test_find_3(self)
import unittest
from union_find.uf_hwqupc import UF_HWQUPC
class Test_UF_HWQUPC(unittest.TestCase):
def test_to_str(self):
h = UF_HWQUPC(2)
self.assertEqual("UF_HWQUPC:\n" +
" count: 2\n" +
" path compression? True\n" +
" parents: [0, 1]\n" +
" heights: [1, 1]", str(h))
def test_is_connected_01(self):
h = UF_HWQUPC(2)
self.assertFalse(h.is_connected(0, 1))
def test_is_connected_02(self):
h = UF_HWQUPC(1)
self.assertRaises(ValueError, h.is_connected, 0, 1)
def test_is_connected_03(self):
h = UF_HWQUPC(2)
self.assertIsNone(h.update_parent(0, 1))
self.assertTrue(h.is_connected(0, 1))
Run:
uf_main
Unittests for test_uf_hwqupc.Test_UF_HWQUPC
Tests passed: 13 of 13 tests – 2 ms
Test Results
2 ms
/usr/local/bin/python3.9 /Applications/PyCharm.app/Contents/plugins/python/helpers/pycharm/_jb_unittest_runner.py --target test_uf_h
Testing started at 10:11 上午 ...
Ran 13 tests in 0.008s
OK
Launching unittests with arguments python -m unittest test_uf_hwqupc.Test_UF_HWQUPC in /Users/mac/Documents/GitHub/INFO6205/Python/1
Tests passed: 13
Git
Run
TODO
Problems
Debug
Terminal
Python Console
Event Log
Tests passed: 13 (moments ago)
3:22
Python 3.9
master