

Design and Analysis of Algorithm

Bonus4_report

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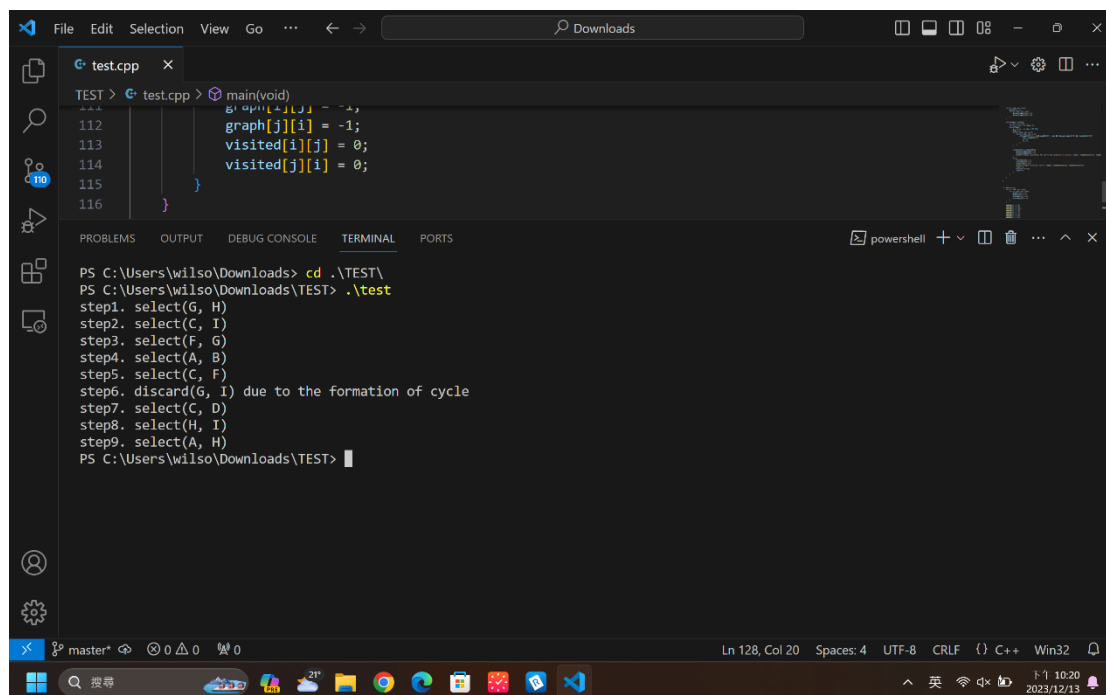
1. The time complexity of Union Find in worst case is $O(V)$ since it needs to traverse through the whole array, in best case is $O(1)$ meaning that the parent is itself.

```
int find(int i){
    while(parent[i] != i) i = parent[i];
    return i;
}

void union_func(int i, int j){
    int a = find(i);
    int b = find(j);
    parent[a] = b;
}
```

2. The time complexity of Kruskal with Union Find in my code in worst case and best case is $O(V^2)$ since I use 2d arrays to implement the course work for simplicity, and in any case, it needs to initialize the 2d array which is of size V^2 , so it is $O(V^2)$.

3. I present how I select edges step by step in my code, it just prints out the messages according to the requirements. Below is the screenshot.



```
TEST > test.cpp > main(void)
112     graph[j][i] = -1;
113     visited[i][j] = 0;
114     visited[j][i] = 0;
115 }
116

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\wilso\Downloads> cd .\TEST\
PS C:\Users\wilso\Downloads\TEST> .\test
step1. select(G, H)
step2. select(C, I)
step3. select(F, G)
step4. select(A, B)
step5. select(C, F)
step6. discard(G, I) due to the formation of cycle
step7. select(C, D)
step8. select(H, I)
step9. select(A, H)
PS C:\Users\wilso\Downloads\TEST>
```