PA3 report

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1. Data structure:

This PA has been divided into two parts: undirected and directed graph.

For undirected graph, I use an array to store the parent set used in disjoint set and a create a struct to represent the edge, each with a (from, to, weight) assignment. Later I use a vector to store all the edges and the remaining edges after using Kruskal’s MST algorithm.

For directed graph, I use also the MST algorithm to find edges first, then I use a Graph to use DFS traversal to see if a new edge from the remaining edges forms a cycle. In DFS, I create three vectors representing white, gray, black vertices.

1. Findings: Since using Maximum Spanning Tree on directed graphs will remove too many edges, so I use DFS to traverse the graph in order to find the cycle. What I found is that if I start traversing from different vertex, it may have different cost. Also, if I don’t use maximum spanning tree from the beginning and use only DFS, it might take a little bit more time, so I choose to use both of them.

Last but not least, some directed graphs can add a lot of edges back after MST while the others might have approximate-optimal answer only after MST.