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CS 428
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# Programming Assignment 3: Design Document

## Design choices:

Decided not to use multiple functions to alleviate juggling around code. Also, this program is short.

A map was used to store the node as a key, and a index as a value. This would improve lookup time to O(1). Another choice was to use an array or lists of structs.

A 2D array was used to store the weights, another choice would have been to use a 2D vector. Array is more efficient at storing fixed size data, but it cannot be passed as a reference, while te contrary applies for vector.

A set was used to store nPrime and remainingNodes. Another choice was to use a list but went for set for reasons mentioned before. Another choice was to use unordered_set, which will be explained in Improvements.

## Failing Cases:

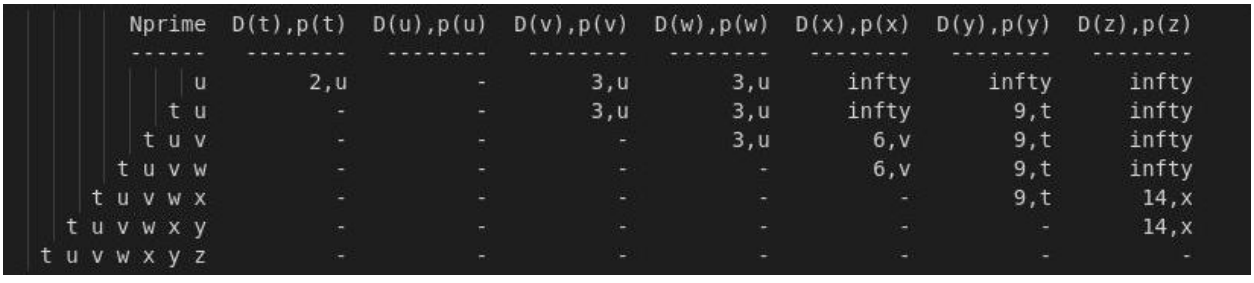
This program does not check the following errors: Input or output file do not exist, there are duplicate weights for the same pair of nodes, negative weights, source node does not exist in map.

Those errors were purposely left unchecked, to keep the code simple assuming the user provides a valid input. Other than those errors, the program runs consistently.

## Improvements:

Besides the error checking, the only improvement I could think of is using unordered sets to store NPrime, as order is not necessary for this function. This would result in a improvement of lookup time at the cost of memory. The reason I chose not to do it was because I could need Nprime to be ordered in the future and because I did not want to import another library.

## Screenshot:



| Nprime | D(t),p(t) | D(u),p(u) | D(v),p(v) | D(w),p(w) | D(x),p(x) | D(y),p(y) | D(z),p(z) |
|---|---|---|---|---|---|---|---|
| u | 2,u | - | 3,u | 3,u | infty | infty | infty |
| t u | - | - | 3,u | 3,u | infty | 9,t | infty |
| t u v | - | - | - | 3,u | 6,v | 9,t | infty |
| t u v w | - | - | - | - | 6,v | 9,t | infty |
| t u v w x | - | - | - | - | - | 9,t | 14,x |
| t u v w x y | - | - | - | - | - | - | 14,x |
| t u v w x y z | - | - | - | - | - | - | - |