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## CMPT 380 Assignment 2

"assignment2.py" is written and run with python3

The best cost metric for transit on the sky train would likely be time because generally as a passenger any monetary cost is pretty much the same regardless of where you go the biggest difference is time also there are some spots where the transit would be slower even though it may be a closer distance for example between surrey and trinity western because it is a buss instead of a train. Also, as a passenger it is generally more important that you know when you are arriving rather than what the distance is hence why many people when asked how far something is the response is usually in the form of how long it would take to get there.

The best search algorithm for this would be an algorithm that finds the shortest time between point a and point b without finding themselves in an endless loop I think the most effective search would be a depth first where each pass ends if they reach a dead end or reach the goal or their weight exceeds that of a previously successful run

"Lansdowne Station" to "Trinity Western University"

Breadth first

Path: 'Lansdowne Station, Aberdeen Station, Bridgeport Station, Marine Drive Station, Langara–49th Ave Station, Oakridge–41st Ave Station, King Edward Station, Broadway–City Hall Station, olympic village station, yaletown-roundhouse station, vancouver city center station, waterfront, Burrnard station, Granville Station, Stadium–Chinatown Station, Main Street–Science World Station, Commercial–Broadway Station, Nanaimo Station, 29th Ave Station, Joyce–Collingwood Station, Patterson Station, Metrotown Station, Royal Oak Station, Edmonds Station, 22nd Street Station, New Westminster Station, Columbia Station, Scott Road Station, Gateway Station, Surrey Central Station, Trinity Western University

Cost: 124

Depth first

Path: 'Lansdowne Station, Aberdeen Station, Bridgeport Station, Marine Drive Station, Langara–49th Ave Station, Oakridge–41st Ave Station, King Edward Station, Broadway–City Hall Station, olympic village station, yaletown-roundhouse station, vancouver city center station, waterfront, Burrnard station, Granville Station, Stadium–Chinatown Station, Main Street–Science World Station, Commercial–Broadway Station, Renfrew Station, Rupert Station, Gilmore Station, Brentwood Town Centre Station, Holdom Station, Sperling–Burnaby Lake Station, Lake City Way Station, Production Way–University Station, Lougheed Town Centre Station, Braid Station, Sapperton Station, Columbia Station, Scott Road Station, Gateway Station, Surrey Central Station, Trinity Western University

Cost: 131

Dijkstra

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Path: Lansdowne Station, Aberdeen Station, Bridgeport Station, Marine Drive Station, Langara–49th Ave Station, Oakridge–41st Ave Station, King Edward Station, Broadway–City Hall Station, olympic village station, yaletown-roundhouse station, vancouver city center station, waterfront, Burrnard station, Granville Station, Stadium–Chinatown Station, Main Street–Science World Station, Commercial–Broadway Station, Nanaimo Station, 29th Ave Station, Joyce–Collingwood Station, Patterson Station, Metrotown Station, Royal Oak Station, Edmonds Station, 22nd Street Station, New Westminster Station, Columbia Station, Scott Road Station, Gateway Station, Surrey Central Station, Trinity Western University

cost 124

A\*

Path: Lansdowne Station, Aberdeen Station, Bridgeport Station, Marine Drive Station, Langara–49th Ave Station, Oakridge–41st Ave Station, King Edward Station, Broadway–City Hall Station, olympic village station, yaletown-roundhouse station, vancouver city center station, waterfront, Burrnard station, Granville Station, Stadium–Chinatown Station, Main Street–Science World Station, Commercial–Broadway Station, Nanaimo Station, 29th Ave Station, Joyce–Collingwood Station, Patterson Station, Metrotown Station, Royal Oak Station, Edmonds Station, 22nd Street Station, New Westminster Station, Columbia Station, Scott Road Station, Gateway Station, Surrey Central Station, Trinity Western University

Cost: 124

Extra: advanced/cut-off depth first

Path:

'Lansdowne Station, Aberdeen Station, Bridgeport Station, Marine Drive Station, Langara–49th Ave Station, Oakridge–41st Ave Station, King Edward Station, Broadway–City Hall Station, olympic village station, yaletown-roundhouse station, vancouver city center station, waterfront, Burrnard station, Granville Station, Stadium–Chinatown Station, Main Street–Science World Station, Commercial–Broadway Station, Renfrew Station, Rupert Station, Gilmore Station, Brentwood Town Centre Station, Holdom Station, Sperling–Burnaby Lake Station, Lake City Way Station, Production Way–University Station, Lougheed Town Centre Station, Braid Station, Sapperton Station, Columbia Station, Scott Road Station, Gateway Station, Surrey Central Station, Trinity Western University

Cost: 131

Teleportation:

Adding an instantaneous teleportation between trinity western and north Vancouver would cause traveling to north Vancouver to be more efficient/faster because the only other path to trinity western is through Surrey Central Station which has a cost of 63 but the cost from Surrey Central Station to north Vancouver is only 50. I confirmed this using A\*

Research where would be the best please to implement teleports:

In terms of pure time cost reduction implementing teleports from north Vancouver to trinity western would have the greatest effect because the cost from surrey to trinity western is so staggeringly large.

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Though it may reduce the cost in the majority of cases the teleport is put anywhere other than north Vancouver because of the 13 cost from waterfront. The problem with putting a teleport at trinity western is that it would see a relatively small amount of use being that the only use would be for trinity students and teachers. Another option would be to find the two furthest points not just the most costly. That way it each teleport could be more effective for a large area. One of the problems with putting the teleport between north Vancouver and trinity is that the only reason to take the teleport from trinity to north Vancouver is if you are leaving from trinity. So, it would be best placed in a spot where both side of the portal has an effect on a large area and a large amount of people. Similarly, it would not make sense to put the two teleports directly next to each other because While it will save a couple cost it is mostly useless. So, summarise the factors to consider would be maximum distance, maximum number of people it will affect, maximum number of other stations it will affect, and cost reduction. It would not be enough to just look at one by itself all aspects are important