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I chose Python for my project.

In order to represent my graph, I chose 3 dictionaries. The first two have keys from 0 to n-1 vertices and have lists that indicate the in and out vertices for each key. The third dictionary is for costs, each edge in the graph is a tuple key and holds the cost to move from the beginning vertex to the end one.

Functions:

In the TripleDictGraph class:

1. def \_\_init\_\_(self, nr\_of\_vertices):
  - Input: number of vertices
  - Output: creates the graph with the three empty dictionaries
2. def is\_edge(self, x, y):
  - You will input the two vertices between which you want to check if there is an edge
  - Return 1 if there exists an edge and 0 otherwise
3. def is\_vertex(self, x):
  - Input: a vertex
  - Output: 1 if it's a vertex, 0 otherwise
4. def add\_edge(self, x, y, c):
  - Input: an edge and its cost (ex: 2 3 100)
  - Precondition: the edge has to not already exist in the graph and the vertices have to exist
  - Output: will add the edge if everything is alright, the beginning and end vertices in each of the in and out dictionaries and then in the cost dictionary the tuple with its cost
5. def print\_edges(self):
  - Output: will print all edges existent in the graph
6. def add\_vertex(self, vertex):
  - Input: a vertex
  - Precondition: the vertex can't already exist
  - Output: a new key that is the new vertex will be added in the in and out dictionaries with an empty list
7. def remove\_vertex(self, vertex):
  - Input: a vertex
  - Precondition: the vertex has to exist in the graph
  - Then the function will check if there are any edges that contain this vertex and delete them
  - Output: will remove the vertex key along with its list from the in and out dictionaries
8. def remove\_edge(self, x, y):
  - Input: an edge (ex: 2 3)
  - Precondition: the edge has to exist in the graph
  - Then for each of the in and out vertices, they will be removed from the in and out dictionaries
  - Output: the tuple will be deleted from the cost dictionaries
9. def nr\_of\_vert(self):
  - Output: will return the number of vertices in the graph

10. def print\_dicts(self):
  - Output: will print the dictionaries in the form that they are kept in the memory
  - For in and out dictionaries: key + list
  - For cost dictionary: the edge tuple and its cost
11. def degree(self, vertex):
  - Input: a vertex
  - Precondition: the vertex has to exist in the graph
  - Output: the in and out degree of the vertex
12. def parse\_vert(self):
  - Output: iterates the set of vertices
13. def parse\_outbound(self, vertex):
  - Input: a vertex
  - Precondition: the vertex has to exist in the graph
  - Output: iterates the set of outbound edges of a given vertex
14. def parse\_inbound(self, vertex):
  - Input: a vertex
  - Precondition: the vertex has to exist in the graph
  - Output: iterates the set of inbound edges of a given vertex
15. def change\_cost(self, x, y, c):
  - Input: an edge and the new cost (ex: 2 3 100)
  - Precondition: the edge has to exist in the graph
  - Output: the cost of the edge will be updated
16. def copy\_graph(self):
  - Output: a copy of the graph

Outside the TripleDictGraph class:

1. def random\_graph():
  - Input: number of vertices and number of edges
  - Output: a randomly generated graph
2. def print\_menu():
  - Contains the menu with the commands
3. def run():
  - Input: file name
  - Prints the menu and calls the above mentioned commands
4. def save\_changes(g):
  - Input: a graph and file name
  - Output: the graph is saved in the given file
5. def file\_graph():
  - Input: file name
  - Output: the graph read from the file