ESTRUCTURA DE DATOS 2
Código ST0247

Laboratory practice No. 1: Graphics

Daniel Felipe Gomez Martinez
Universidad Eafit
Medellín, Colombia
dfgomezm@eafit.edu.co

Cesar Andres Garcia Posada
Universidad Eafit
Medellín, Colombia
cagarciap@eafit.edu.co

3) Practice for final project defense presentation

3.1

To explain the point 1 is necessary to remember that we have a file, in which there are information about the nodes and the edges between nodes of the graph. We can ignore data like name of the node or edges and coordinates about the nodes because these data aren't necessary to implementation.

For representing the city graph, we used a HashTable and HashSet, because the functions of these data structure work in a constant time in a faster way than a list and an efficient way than a matrix. HashTable has by key each node of the graph and by values it has each neighbor Nodes with its respective distance.

In the following table we can see the complexity of some functions about the different data structures analyzed.

DATA STRUCTURE	GET	ADD	REMOVE	CONTAINS
ARRAYLIST	O(1)	O(1)	O(n)	O(n)
LINKEDLIST	O(n)	O(1)	O(1)	O(n)
HASHSET	O(1)	O(1)	O(1)	O(1)
LINKEDHASHSET	O(1)	O(1)	O(1)	O(1)
TREESET	O(Log(n))	O(Log(n))	O(Log(n))	O(Log(n))
HASHTABLE	O(1)	O(1)	O(1)	O(1)

Where n means the number of elements to process.
Take from: http://www.jtech.ua.es/j2ee/publico/lja-2012-13/sesion02-apuntes.html

3.2

Program would use the double of memory according to the amount of nodes in the graphic, because to add a neighbor node, the program needs a path to node in which one the edge start

PhD. Mauricio Toro Bermúdez
Professor | School of Engineering | Informatics and Systems
Email: mtorobe@eafit.edu.co | Office: Building 19 – 627
Phone: (+57) (4) 261 95 00 Ext. 9473

(O(n)) and needs another path to the end of the list of this node (O(n)), so O(n) X O(n) = O(n X n) = $O(n^2)$.

3.3

We didn't have problems with that aspect.
To read and separate the string, we use substring with the space between ID of Node and the coordinates. Finally to determine the place on the HashTable is more easy work with IDs that don't start with the same letter or number, because if the IDs start with the same letter or number is very difficult determine that they are different.

3.4

The data structure implemented is a List of objects (Vertex type) where only the vertices are stored and not the connections, because the verciteces have as an attribute a class of itself, which functions as the connection of one vertex with anotherv. those connections determine whether the vertices can be joined or not.

3.5

By the implementation of a list the Big O of method is O(n).

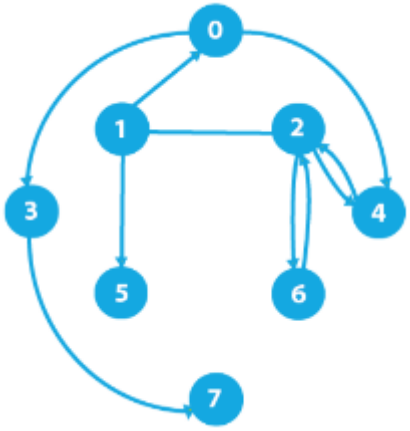
3.6

"n" is the number of vertexs to créate.
"a" is the number of arcs to créate.
"i" is going to be the iterator of a cycle that will create the list with n vertexs.
"b-r" b and r are the two vertices that you wish to join.

So the creation and connection of the vertices will be of order n.

4) Practice for midterms

4.1



	0	1	2	3	4	5	6	7
0				1	1			
1	1		1			1		
2		1			1		1	
3								1
4			1					
5								
6			1					
7								

PhD. Mauricio Toro Bermúdez
Professor | School of Engineering | Informatics and Systems
Email: mtorobe@eafit.edu.co | Office: Building 19 – 627
Phone: (+57) (4) 261 95 00 Ext. 9473

Assuming that the edge between the node 1 and node 2 is bidirectional.

4.2

0 → [3, 4]
1 → [0, 2, 5]
2 → [1, 4, 6]
3 → [7]
4 → [2]
5
6 → [2]
7

Assuming that the edge between the node 1 and node 2 is bidirectional.

4.3

$O(n^2)$
Because, in the first list I will add only one node (O (n)), after that, the nodes that I will add will be added consecutively to the end of the list and this represents a path to the last element, (O (n)).
O (n) X O(n) = O (n X n) = $O(n^2)$
Where n means the number of nodes to process.

CHANGE REPORT

INTEGRANTE	FECHA	HECHO	HACIENDO	POR HACER
Daniel Felipe Gómez Martinez Y Cesar Andres Garcia Posada	01/02/2019		Reading and understanding the laboratory.	Analyze data structures.
Daniel Felipe Gómez Martinez	01/02/2019	Reading the file ".txt" and the Vertex class. (For point 2).	The enum type class for the classification of vectors.	Storage structure of the vectors.
Cesar Andres Garcia Posada	01/02/2019	Analysis of data structures (for point 1).	Reading about graphs and basic implementations.	Determine the data structure for the implementation of the city chart.
Daniel Felipe Gómez Martinez	02/02/2019	Implementation of lists (List) as structure to store	Method to characterize the vertices and finalize	Test cases.

PhD. Mauricio Toro Bermúdez
Professor | School of Engineering | Informatics and Systems
Email: mtorobe@eafit.edu.co | Office: Building 19 – 627
Phone: (+57) (4) 261 95 00 Ext. 9473

		the vertices. (For point 2)	the solution of the exercise.	
Cesar Andres Garcia Posada	02/02/2019	Data structure to work: HashTable - HashSet. (For point 1).	Class for file reading and implementation of the HashTable and HashSet.	Laboratory Report and test cases.
Cesar Andres Garcia Posada	03/02/2019	Class implementation	Laboratory report	
Daniel Felipe Gómez Martinez Y Cesar Andres Garcia Posada	03/02/2019	Laboratory report	Partial simulation questions	Optional points for more learning.

PhD. Mauricio Toro Bermúdez
Professor | School of Engineering | Informatics and Systems
Email: mtorobe@eafit.edu.co | Office: Building 19 – 627
Phone: (+57) (4) 261 95 00 Ext. 9473