Laboratory practice No. 5: Graphs

Camila Barona Cabrera
Universidad Eafit
Medellín, Colombia
cbaronac@eafit.edu.co

Felipe Sosa Patiño
Universidad Eafit
Medellín, Colombia
fsosap@eafit.edu.co

3) Practice for final project defense presentation

3.1 we use a hash map for save the information, because making the vertex ID as the key of that structure we have access to the object vertex, who stores the coordinates x and y, and the name of the vertex. But we didn't use that access value of the hash map just for the object of vertex, we made a pair of the vertex object and a linked list that have all the edges that connect the vertex with others. That edges stores the vertex ID of both vertex, the distance between them, and the name of that edge.
3.2 O(n^2) because the matrix is going to store n columns and n rows. so the matrix, having 300.000 vertex, would have to store 300.000^2 data. Like when you have 3 columns and 3 rows, the matrix is going to save 9 spaces of adjacency.
3.3 we solve that problem making the hash map, because we don't need to have the vertex ID sorted, we just put it in the hash map, with his appropiate pair (the vertex and the linked list of edges).
3.4 The data structure used in this exercise are initially an adjacency matrix in order to implement a graph, within this we Will saved the nodes that Will give the size of the matrix, and Will initially be filled with 1 in the origin and destination coordinates written by the console, in addition the exercise has an arrangement os the size of the graph wich is responsable for simulating the colors to indicate if this matriz meets or not, and finally a stack (wich would not increase the complexity because insert and remove methods are O(1)) that has a function to be a kinf of counter with respect to the nomber of nodes, and likewise to find within the array of colors where the colors are repeated consecutively.

The algorithms we did during this exercise were base don comparing whether the colors stored within the graph were equals to indicated if they are bicolorable or not, so we chose a number as the base that Will fill the array of colors. Likewise, the value found in the stack will be stored in a variable that indicates whether the color in that position is equal to the color found in the graph. To indicate if the values are adjacent we verify both the current color (stored in the stack) and the color stored within the array in such a way that in order to differentiate them, a quantity is subtracted from the color in the current position and stored inside the array, if these at some point they become equal, the condition would not be met.

3.5 Complexity: O(n^2)

3.6 The variable n of the previous complexity calculation is the number of rows in the matrix and the number of columns.

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									

4.2 0 -> [3,4]
1 -> [0,2,5]
2 -> [1,4,6]
3 -> [7]
4 -> [2]
5 -> [ ]
6 -> [2]
7 -> [ ]

4.3 b.

5) Recommended reading (optional)

Graphs Graphs are data structures rather like trees, a graph is conformed by nodes and edges; for example: nodes in a graph represent cities, while edges represent airline fight routes between the cities. Two methods are commonly used for graphs are: The adjacency matrix and the adjacency list. An adjacency matrix is a two-dimensional array in which the elements indicate whether an edge is represent between two vertices, if a graph has N vertices, the adjacency matrix is an NxN array. The list adjacency list refers to a linked list; each individual list shows what vertices a given vertex is adjacent to. For represent a graph in a program is necessary to implement: vertices, (in a very abstract graph program you could simply number the vertices O to N-1 (where N is the number of vertices), and edges (Each vertex may be connected to an arbitrary number of other vertices).In general exists two principal kinds of graphs: Directed graphs: however, graphs are often used to model situations in which you can go in only ine direction along an edge; from A to B but not from B to A, as on a one-way street, and weighted graphs: in some graphs, edges are given a weight, a number that can represent the physical distance between two vertices, or the time it takes to get from one vertex.

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

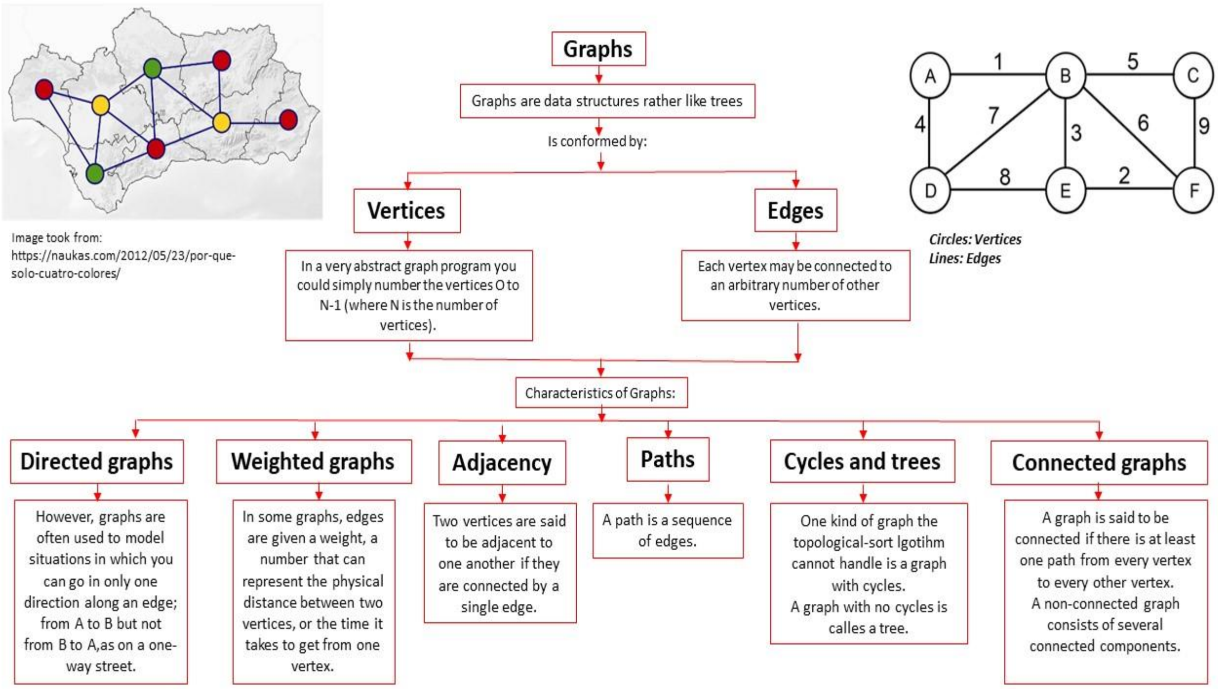

Image took from: https://naukas.com/2012/05/23/por-que-solo-cuatro-colores/

Image took from: https://commons.wikimedia.org/wiki/File:Boruvka-example2.gif

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