ESTRUCTURA DE DATOS 1
Código ST0245

Laboratory practice No. 5: Graph Implementation

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3) Practice for final project defense presentation

3.1 For representing the map of the city, we decided to use a Graph, we created this using the package networkx which helped us to reduce running time on the creation of the graph. In addition, we decided to use the open command from python for reading the origin data and dividing it into different parameter for the graph.
3.2 Taking into account that there is 310153 vertexes, therefore, we have a mtriz of 310153^2 positions of integeres. So the storage would be:
$310153*310153*4 = 3.847795336*10^{11}$ bytes.
3.3 Initially we created a dictionary with the information of every location, using its ID as key and giving every place a new numeration with a counter, then we used this dictionary for creating the graph, using the new numeration as ID.
3.4 In order to solve the problem, the algorithm uses a Breadth First Search (BFS), because it allows to go through the graph for each neighbour of every vertex, so it is easier to paint the neighbours of a vertex with the opposite color of this vertex. Taking into account this, the best data structure to get this, is a graph which consists in connections between nodes called vertexes and usually with a weight in the edge wich connects two vertexes.
3.5 Because the imlementation of the graph is based on lists, the complexity of the algorithm isBicolorable is:
$\mathbf{T(v, n) = C_1v + C_2(v + n) + C_3(v + n)}$
$\mathbf{O(T(v,n)) = O(C_1v + C_2(v + n) + C_3(v + n))}$
$\mathbf{O((C_2+C_3)(v + n))}$ // sum rule
$\mathbf{O(v + n)}$ // product rule
3.6 v: graph vertexes number
n: edges of the graph

4) Practice for midterms

4.1)

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

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

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

4.3) b
4.4.1) ii
4.4.2) i

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