T.C.

MARMARA UNIVERSITY

FACULTY of ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

CSE2046 - Analysis of Algorithms

Homework II - Report

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Details of Graph Coloring Problem

The process of assigning colors to each vertex of a graph G in such a way that no two adjacent vertices have the same color is known as graph coloring problem. The goal is to use as small number of colors as possible when coloring a graph. The chromatic number of a graph G is the least number of colors required to color it. The graph coloring problem is an NP Complete problem.

Basic method to Color a Graph:

Step 1 − Arrange the vertices of the graph in some order.

Step 2 − Choose the first vertex and color it with the first color.

Step 3 − Choose the next vertex and color it with the lowest numbered color that has not been colored on any vertices adjacent to it. If all the adjacent vertices are colored with this color, assign a new color to it. Repeat this step until all the vertices are colored.

Details of the Code

We adapted the object oriented manner in the code. We have one 'Vertex' class, three methods and a main method.

vertex class: In this class we are creating node objects. For each node we have a node id (number), node color and the list of adjacent nodes (initially empty).

search vertex method: we have two lists vertices and colors. In this method we search for a specific node in vertices list if the node exists we return that node if not we append the node to the list.

colorize vertices method: In this method We add as many colors, as the number of adjacent nodes, to the list of colors. We have a list named temp.

This list contains all the colors of adjacents nodes for a specific node. We compare each color in the color list with the color of the nodes in the temp list. We give the first color that is not in the adjacent nodes to the node we have.

main method: We take input file in here. We only read txt files. We go through the txt file line by line. we add adjacent nodes to the adjacents list.
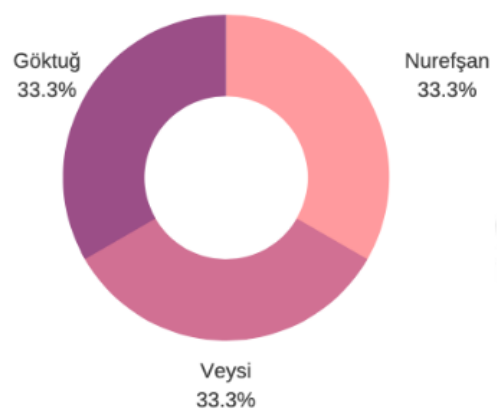
print output method: Creates an output file.

Outputs

Input File	Optimal Solution
test1.txt (138 vertices, 986 edges)	11
text2.txt (500 vertices, 62624 edges)	72
test3.txt (1000 vertices, 246708 edges)	122
test4.txt (900 vertices, 307350 edges)	204

Division of Labor
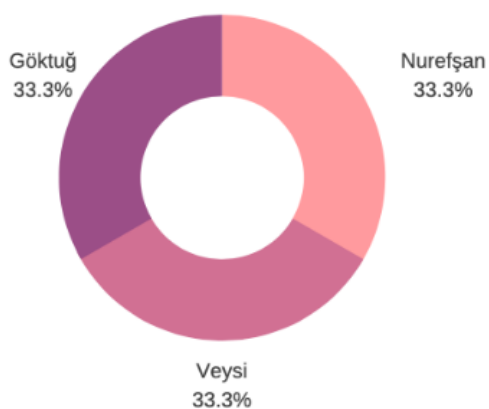
Code

Report

References

The graph coloring. Tutorials Point. (n.d.). Retrieved June 5, 2022, from https://www.tutorialspoint.com/the-graph-coloring