Find Minimum Vertex-Coloring of a Graph.

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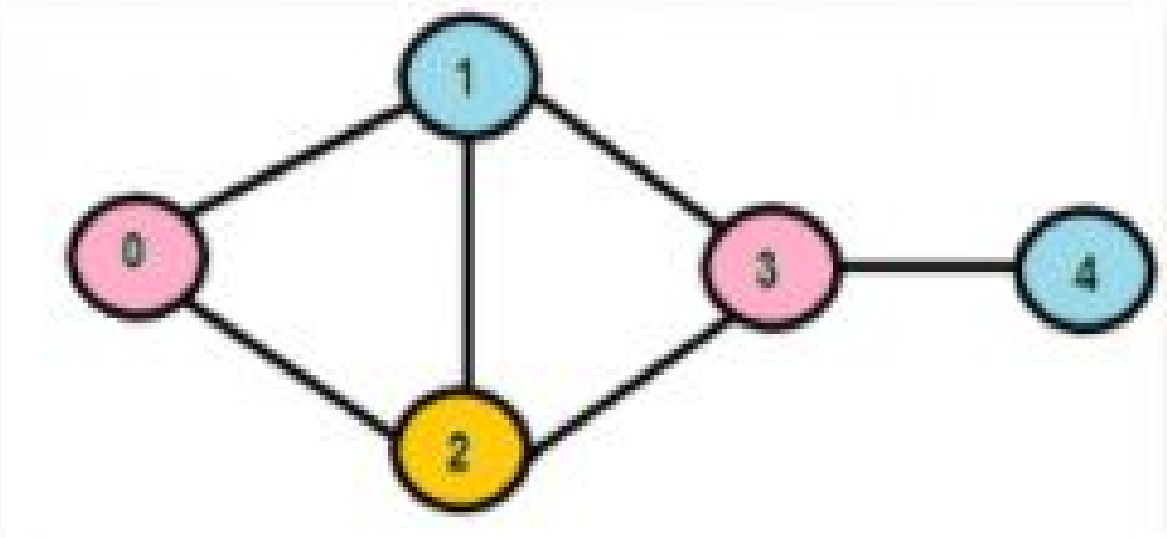
Introduction

1. Vertex-Coloring of a graph is assigning colors to every vertex of a graph such that no two adjacent vertices are colored using the same color.

2. Chromatic number is the smallest number of colors needed to color a graph and our aim is to find the chromatic number and color the graph using this.

3. Graph Coloring has many applications like making time table, Map Coloring.



A Graph Colored with 3 different colors (Chromatic number is 3).

Method 1 -:

1.) Color first vertex with first color
2.) Do following for remaining V-1 vertices.

2.1) Consider the currently picked vertex and color it with the lowest numbered color that has not been used on any previously colored vertices adjacent to it. If all previously used colors appear on vertices adjacent to v, assign a new color to it.

2.2) Pick Next Vertex and Follow step 2.

Method 2 -:

1.) Find the degree for each vertex.
2.) List the vertices in order of descending degree (if two or more vertex have same degree then we can select either one).
3.) Color the first vertex in the list (the vertex with the highest degree) with color 1.
4.) Go down the list and color every vertex not connected to the colored vertices above the same color. Then cross out all colored vertices in the list.
5.) Repeat the process on the uncolored vertices with a new color — always working in descending order of degree until all the vertices have been colored.

Time Complexity

Method 1 -: $O(N^2)$.

Method 2-: $O(N^2)$.


Thank you.