Frequency Assignment in cellular networks

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Agenda

- Problem statement
- Graph coloring
- Solution to the problem
- Explanation

Problem Statement

- High Demand for Cellular Mobile Services.
- Has already reached its Capacity Threshold.
- Different techniques can be used to increase the capacity. (give examples)
- Best solution : Frequency Reuse.

- Frequency assignment is an important problem in the operation of the mobile networks.
- So, I propose a solution using Graph Coloring Method.
- The solution is to assign a frequency for every call from the mobile device.

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Graph Coloring

Graph coloring is an assignment of colors to the elements of a graph.

- Graph coloring is composed of three types :-
  - Vertex coloring
  - Edge coloring
  - Region coloring

Vertex Coloring:

DEFINITION: The vertex coloring of a graph is coloring of the vertices such that no 2 adjacent sides receive same color.

USES:

- Model many scheduling problems
- Optimal assignments of channels to radio stations and spectrum frequencies to mobile operations

OBJECTIVE:

- Find the minimum number of colors needed to color the vertices of a graph as possible.
- This minimum number to color the vertices of a graph is known as **Chromatic number**.

Edge coloring:

- The edge coloring is to color the edges of a given graph with fewest colors such that no two edges incident to a common vertex are assigned with the same color.
- The problem finds application in assigning class room to course and in scheduling problems.
- The minimum number of colors needed to color a graph is known as chromatic index.

Region Coloring:

- Region coloring is generally used to color a map.
- The graph has a vertex for each region of the map and an edge connecting two vertices if and only if the regions share a common boundary.
- Region coloring is done in a way that no two regions sharing a common boundary are assigned with same color.

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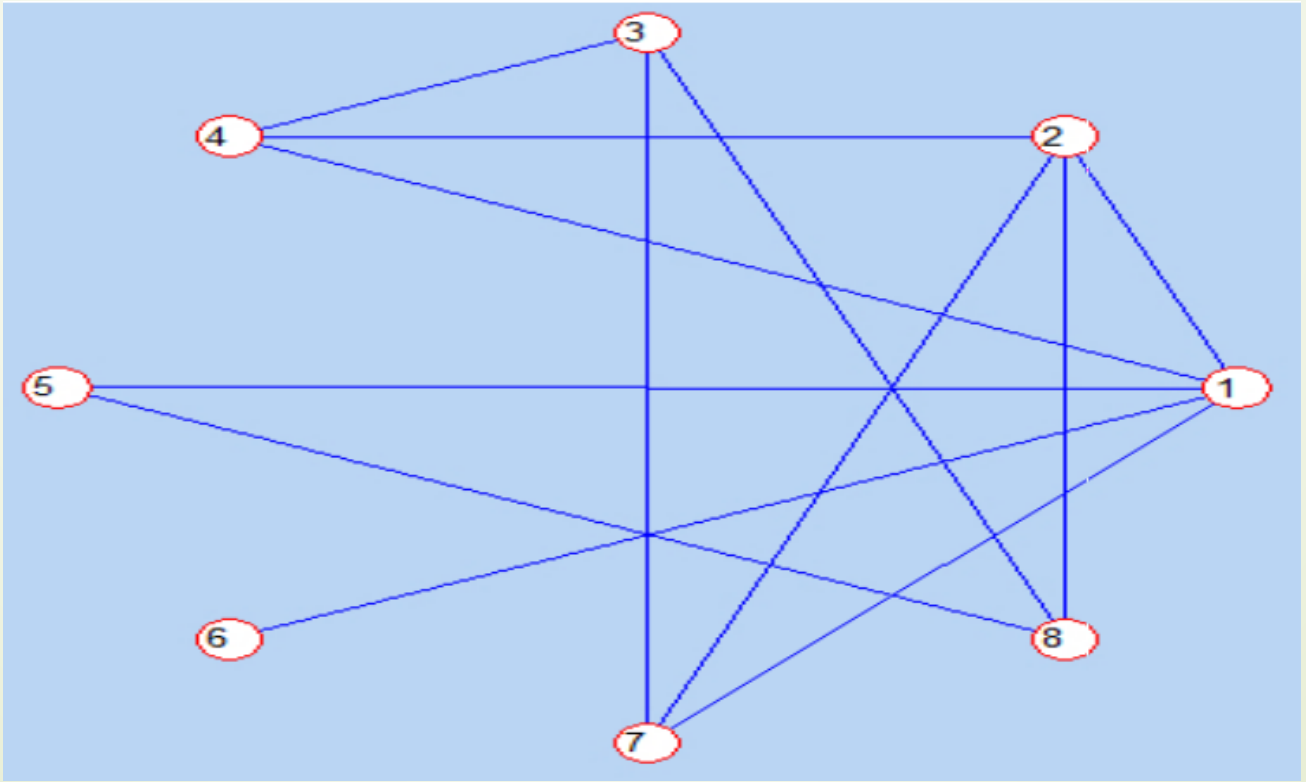
Solution to the problem

- The problem is now divided into three sub problems :-
  - Graph Creation
  - Graph Coloring

Solution to the problem

- Graph Creation
  - The Graph G = (V,E) where V represents non- empty sets of vertices and E represents non empty set of edges which shows relationship among vertices.

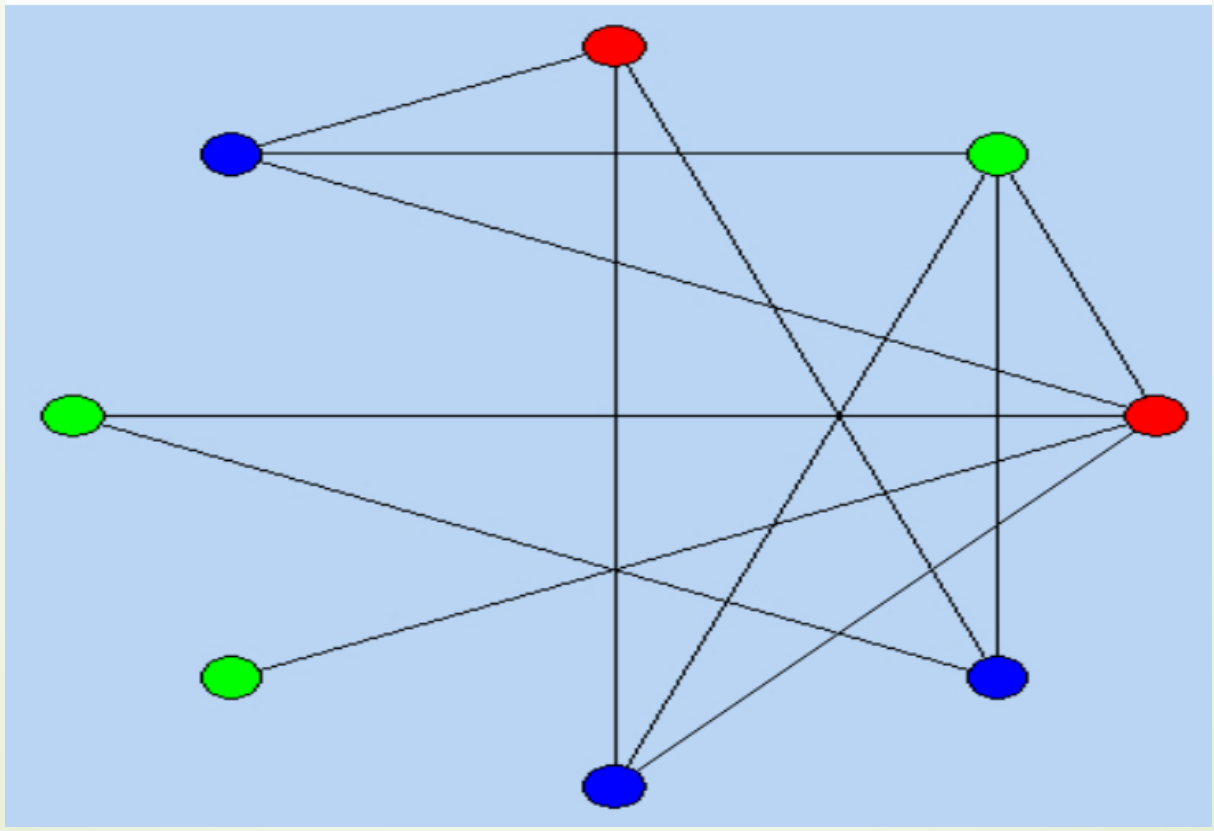


Solution to the problem

- Graph Creation
  - The Graph which has to be colored is represented with 8 vertices
  - The graph G which is a collection of vertices and edges, where V = {1, 2, 3, 4, 5, 6, 7, 8} and E = {(1,2),(1,4),(1,6),(1,7),(2,1),(2,4),(2,7), (2,8),(3,4),(3,7),(3,8),(4,1),(4,2),(4,3),(5,1),(5,8),(6,1),(7,3), (7,2),(7,1),(8,5),(8,3),(8,2)}.

Solution to the problem

- Here is the graph with coloring



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Explanation

- From the above graph ,consider the frequencies allocating to network users as colors.
- The minimum number of colors i.e., the communication between users is obtained by using minimum number of frequencies.
- The nodes of a cellular graph connected with an edge must be assigned different colors i.e., users located close to each other.

By this our Agenda gets completed.

THANK YOU

Questions??