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| **Subject** | Design and Analysis of Algorithms (DAA) |
| **Experiment No.** | 8 |
| **Aim** | To implement Backtracking (Graph Coloring). |
| **Code:** | #include <stdio.h>  #include <stdbool.h>  #define MAX\_VERTICES 100  int vertices, edges;  int graph[MAX\_VERTICES][MAX\_VERTICES];  int colors[MAX\_VERTICES];  *// Function to check if it's safe to assign color 'c' to vertex 'v'*  bool isSafe(int *v*, int *c*) {      for (int i = 0; i < vertices; i++) {  *// Check if there is an edge between 'v' and 'i' and if the color of 'i' is 'c'*          if (graph[*v*][i] && *c* == colors[i]) {              return false; *// If the condition is true, it's not safe to assign 'c' to 'v'*          }      }      return true; *// It's safe to assign 'c' to 'v'*  }  *// Recursive function to perform graph coloring using backtracking*  bool graphColoringUtil(int *v*, int *m*) {  *// If all vertices are assigned colors, return true*      if (*v* == vertices) {          return true;      }  *// Try assigning colors to 'v'*      for (int c = 1; c <= *m*; c++) {  *// Check if it's safe to assign color 'c' to vertex 'v'*          if (isSafe(*v*, c)) {              colors[*v*] = c; *// Assign color 'c' to vertex 'v'*  *// Recur to assign colors to the rest of the vertices*              if (graphColoringUtil(*v* + 1, *m*)) {                  return true; *// If coloring is possible, return true*              }              colors[*v*] = 0; *// Backtrack: Remove color assignment if coloring is not possible*          }      }      return false; *// If no color can be assigned to this vertex, return false*  }  *// Main function to perform graph coloring*  bool graphColoring(int *m*) {  *// Call the utility function with vertex 0 and m colors*      if (!graphColoringUtil(0, *m*)) {          printf("No solution exists\n");          return false;      }      printf("The graph can be colored using %d colors as follows:\n", *m*);      for (int i = 0; i < vertices; i++) {          printf("Vertex %d: Color %d\n", i, colors[i]);      }      return true;  }  int main() {  *// Input the number of vertices*      printf("Enter the number of vertices: ");      scanf("%d", &vertices);  *// Input the number of edges*      printf("Enter the number of edges: ");      scanf("%d", &edges);  *// Input the adjacency matrix representing the graph*      printf("Enter the adjacency matrix:\n");      for (int i = 0; i < vertices; i++) {          for (int j = 0; j < vertices; j++) {              scanf("%d", &graph[i][j]);          }      }  *// Input the number of colors available*      int m;      printf("Enter the number of colors available: ");      scanf("%d", &m);  *// Perform graph coloring*      graphColoring(m);      return 0;  } |
| **Output** |  |
| **Pseudo Code** |  |
| **Conclusion** | Hence, by completing this experiment I came to know about implementation of Graph Coloring using Backtracking. |