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**CSCI 6511 Project 1**

Main.py is a python program that implements the backtracking algorithm for solving a graph coloring problem using constraint satisfaction. The program reads an input file that contains a graph represented as a set of edges, and the number of colors available for the coloring. It then creates a Graph object and adds the edges to the graph using the add\_edge method.

The csp\_coloring function takes the Graph object and the number of colors as input and returns a dictionary that maps each vertex to its color if a solution is found, or None otherwise. The function uses backtracking to find a solution to the problem.

The domains variable is a dictionary that maps each vertex to a set of available colors. The constraints variable is a dictionary that maps each pair of vertices to a lambda function that checks whether the colors assigned to the two vertices satisfy the constraint that no adjacent vertices have the same color.

The order\_domain\_values function is a heuristic that orders the values in the domain of a variable based on the number of conflicts it causes with its neighbors.

The select\_unassigned\_variable function is a heuristic that selects the variable with the smallest domain.

The backtrack function recursively tries to assign a color to each unassigned variable, making sure that the assigned colors satisfy the constraints. It returns a dictionary that maps each variable to its assigned value if a solution is found, or None otherwise.

The ac3 function is an implementation of the Arc-Consistency Algorithm, which reduces the domains of variables based on their constraints. It takes a queue of arcs as input and returns True if all domains are consistent with the constraints, or False otherwise.

The remove\_inconsistent\_values function removes values from the domain of a variable that are inconsistent with the constraints with its neighbors.

Finally, the program prints the solution if one is found or a message indicating that no solution was found.

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