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CSCI 6511 Project 2

Description Document

Graph Coloring Problem:
The algorithm requires two inputs: a graph and the number of colors that can be used to color the graph's vertices. The algorithm finds a suitable vertex coloring where no two adjacent vertices are given the same color and each vertex is given a color.

The algorithm employs a number of techniques, including the search algorithm, heuristics (min remaining values, least constraining value, and constraint propagation using AC3), and constraint propagation using AC3.

The add edge method of the 'MyGraph' class, which represents the graph, allows you to add new edges to the diagram. The function 'parse_input_file' reads the input file, creates a Graph object, and determines the number of colors that can be used to color the graph. The primary function for implementing the CSP algorithm to address the graph coloring problem is 'csp coloring'.

The possible colors that can be assigned to a vertex are represented by the 'domains' variable. The requirements that must be met are represented by the 'constraints' variable. The MRV (Minimum Remaining Values) heuristic is used by the 'order domain values' function to order the domain values for a variable. According to the LCV (Least Constraining Value) heuristic, the 'select unassigned variable' function chooses an unassigned variable with the fewest remaining values in its domain.

The recursive function called 'backtrack' implements the search algorithm used to solve the CSP problem. The 'ac3' function implements the AC3 algorithm to propagate constraints and remove inconsistent values. Remove inconsistent values from a variable's domain using the 'remove inconsistent values' function.

The CSP problem's solution is then returned by the 'csp coloring function' as a dictionary, where the keys are the vertices and the values are the colors that were given to them. It returns None if there isn't a solution.