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Chapter 6 HW: 6.1,6.3,6.8 pgs 202-227

6.1 How many solutions are there for the map-coloring problem in Figure 6.1? How many solutions if four colors are allowed? Two colors?

three colors: 3*2*1*1*1*1*3 = 18 possible solutions

four colors: 4*3*2*2*2*2*4 = 768 possible solutions

two colors: 0, Cannot be done

6.3 Consider the problem of constructing (not solving) crossword puzzles: fitting words into a rectangular grid. The grid, which is given as part of the problem, specifies which squares are blank and which are shaded. Assume that a list of words (i.e. a dictionary) is provided and that the task is to fill in the blank squares by using any subset of the list. Formulate this problem precisely in two ways:

a. As a general search problem. Choose an appropriate search algorithm and specify a heuristic function. Is it better to fill in blanks one letter at a time or one word at a time?

A very simplistic method would be to use depth-first search and put in one word at a time. With this there isn't a need for a heuristic function.

b. As a constraint satisfaction problem. Should the variables be words or letters?

I feel this can be done either way. It can be done box by box with letters and constraints that the letters must make a word. Combined with the minimum-remaining-value and degree heuristic it would work rather well.

6.8 Consider the graph with 8 nodes A1, A2, A3, A4, H, T, F1, F2. Ai is connected to Ai+1 for all i, each Ai is connected to H, H is connected to T, and T is connected to each Fi. Find a 3-coloring of this graph by hand using the following strategy: backtracking with conflict-directed buckjumping, the variable order A1, H, A4, F1, A2, F2, A3, T, and the value order R, G, B.

See work below the table

Variable	Constraint Set	Final Colors
A1	{A2, H}	R
A2	{A1, A3, H}	B
A3	{A2, A4, H}	R
A4	{A3, H}	B
H	{A1, A2, A3, A4, T}	G
T	{H, F1, F2}	B
F1	{T}	R
F2	{T}	R

A1 = R
H = R conflicts with A1, H = G
A4 = R
F1 = R
A2 = R conflicts with A1, A2 = G conflicts with H, A2 = B
F2 = R
A3 = R conflicts with A4, A3 = G conflicts with H, A3 = B conflicts with A2 Need to backtrack. A2 is most recent, A2 new constraint set {A1, A4, H} Which leads to all colors having conflicts so we back-jump to A4 with A4 constraint set now being {A1, A3, H} and returning A2 constraint set to its original state.

With new constraint set for A4 we try again.
A1 = R
H = R conflicts with A1, H = G
A4 = R conflicts with A1, A4 = G conflicts with H, A4 = B
F1 = R
A2 = R conflicts with A1, A2 = G conflicts with H, A2 = B
F2 = R
A3 = R
T = R conflicts with F1, T = G conflicts with H, T = B