Module 6 Self Check

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October 2024

1 CSP

1. BT+FC using a static ordering [A, B, C, D] for variables and a static ordering for values [1,2,3,4].

   Step 1 is going to be assigning A = 1, as A's domain is {1,2,3,4}. Now we can apply forward checking to remove 1 from B's domain, which is now {2,3}. We can also remove 1 from C's domain which is now {2}.

   Step 2 is to attempt to assign B = 2. We then forward Check C which has no options if B = 2 so we back track and set B = 3.

   Step 3 is to assign C = 2. There are no other possible values to choose from.

   Step 4 we can assign D$\bar{3}$. This is because of the static ordering. Both 3 or 4 could be used here as no constraints are broken with either, but as we are utilizing static ordering we use the first available value.

2. BT+FC on the constraint graph using Minimum Remaining Values for variables and a static ordering for values [1, 2, 3, 4].

   Step 1: We utilize MRV to find which variables have the lowest amount of values. This is C and D both with 2, we break the tie by alphabetical ordering so we choose C. We can then assign C = 1 for the static ordering for the values. Forward checking eliminates 1 from A's domain.

   Step 2: We then utilize MRV again and find that D has the smallest amount of variables left. We can then assign D = 3. Forward checking we find that A contains a 3 thus it is removed.

   Step 3: A now has only 2 variables meaning it has the Minimum remaining values. We assign A = 2 and forward check, finding that 2 is the only remaining variable in B thus we must back track and set A = 4.

   Step 4: B is all that remains with 2, thus B = 2.

3. BT + FC on the constraint graph using Degree Heuristic for variables and a static ordering for values [1, 2, 3, 4].

   Step 1: Utilize Degree Heuristic to determine first variable, A is constrained by 3 meaning it has the highest degree. We can then set A = 1. We forward check and find that B and C need 1 removed from them.

   Step 2: Both B and C have the highest Degree, breaking the ties alphabetically means we choose B. Set B = 2 and forward check to find that we cannot set B = 2 as C would be left with no variables. We then set B = 3, forward checking we remove 3 from A.

   Step 3: C has the next highest degree (tied with D but alphabetically next). C = 2 as that is all that remains.

   Step 4: D is all that is left, we can set this to 3 as that breaks no domains on A.

4. BT + FC on the constraint graph using Minimum Remaining Values for variables and Least Constraining Value for values.

Step 1: We utilize MRV to find which variables have the lowest amount of values. This is C and D both with 2, we break the tie by alphabetical ordering so we choose C. Both 1 and 2 have a constraining value of 3 so we assign C = 1. We remove 1 from both A and B's domains.

Step 2: B is then found by MRV as the next variable to assign (tied with D). 2 has the lowest constraining value of 2 (was 3 but C is assigned) so we set B = 2. Forward checking we remove 2 from A's Domain.

Step 3: Both A and D have 2 variables left meaning we set A first. A can be set to 3, forward checking with D we remove 3 from its domain.

Step 4: D only has 4 left, thus D = 4.