hw2_csps_q2_csp_properties

Question 2: CSP Properties

0.0/5.0 points (graded)

Select all of the following statements about CSPs that are true.

- [x] Even when using arc consistency, backtracking might be needed to solve a CSP. ✔
- [x] Even when using forward checking, backtracking might be needed to solve a CSP. ✔
- [ ] None of the above

Option 1: Arc consistency is often not sufficient on its own to solve a CSP.
Consider a CSP with three variables, where the only constraint involves all three variables. Because it is not a binary constraint, arc consistency will not reduce any of the domains, and normal backtracking search is necessary.
Explicitly, consider a CSP with variables A∈{1,2}, B∈{1,2}, C∈{3,4}. The only constraint is that A+B>C. Using MRV and LCV, and breaking ties by choosing the lowest value/variable, the first assignment would be A=1, while the only solution is A=2,B=2,C=3.
Option 2: See the CSP described in the solution above.
Option 3: Since both of the other answers to this question are true, and they are both above this one, this one is false.

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0.0/5.0 points (graded)

Select all of the following statements about CSPs that are true.

- [ ] When using backtracking search with the same rules to select unassigned variables and to order value assignments (in our case, usually Minimum Remaining Values and Least-Constraining Value, with alphabetical tiebreaking), arc consistency will always give the same solution as forward checking, if the CSP has a solution.
- [x] For a CSP with binary constraints that has no solution, some initial values may still pass arc consistency before any variable is assigned. ✔
- [ ] None of the above

Option 1: This can occur if the CSP has multiple solutions, and arc consistency reduces the domains in a way such that a different value is the least constraining value. For example, consider the following CSP: There are three variables: A, B, and C, each with domain {1,2,3}. The constraints are that no two variables can have the same value, and that B must be less than both A and C. Using LCV and MRV, and breaking ties by selecting the lowest value or variable, with arc consistency, the solution will be A=2, B=1, C=3. Meanwhile, using forward checking, the solution will be A=3, B=1, C=2.
Option 2: Consider the following CSP: Three variables, A, B, C, each with domains {1,2}. The only constraint is that no two variables can have the same value. Enforcing arc consistency will not eliminate any value from any domain, because arc consistency only considers two variables at a time.
Option 3: If you've read this far in the solutions, you should know that this is clearly not correct.

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