

Homework 6

Consistency of CSPs: Terminology and Mechanisms

Assigned: Monday, March 30, 2009

Due: Monday, April 6, 2009

Notes: This homework must be done individually. *If you receive help from anyone, you must clearly acknowledge it.* Always acknowledge sources of information (URL, book, class notes, etc.). Please inform instructor quickly about typos or other errors.

The goal of this homework is to help you become more confident with consistency terminology and algorithms by enticing you to review the lecture material and research it further for completeness and correctness. The homework strongly overlap with Glossary 7. Thus, you should not hesitate to reuse/refine material you may have submitted for Glossary 7.

1 Local Consistency Properties

Consider the local consistency properties for CSPs below:

1. Arc consistency
2. Path consistency
3. i -consistency
4. (i, j) -consistency
5. $(1, m)$ -consistency (also known as inverse consistency)
6. Generalized Arc consistency (GAC)
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8. Relational 1-Consistency (a.k.a. relational arc-consistency)
9. Relational 2-Consistency (a.k.a. relational path-consistency)
10. Relational m -Consistency (RmC)

11. Relational (i, m) -Consistency ($R(1, m)C$)

12. m -wise consistency ($R(*, m)C$)

For each of the above listed properties, answer the following questions:

1. Informally define the property using the using the following format: *(2 points)*

\langle This property \rangle guarantees that every consistent partial solution of length $\langle x \rangle$ can be extended to a solution of length $\langle y \rangle$.

2. Give the name of one or more algorithms to enforcing the property. *(1 point per algorithm)*

3. State whether the algorithms you listed. *(1 point per algorithm per effect)*

- (a) Filter the domains.
- (b) Filter the constraints.
- (c) Add new constraints to the problem.

4. Give the complexity of each of the algorithms you listed. *(1 point per algorithm per complexity)*

- (a) Time complexity
- (b) Space complexity

2 Other Local Consistency Properties for CSPs

Define informally or formally, but as clearly as you can, the local consistency properties below:

1. Singleton Arc Consistency *(1 point)*

2. Neighborhood inverse consistency *(1 point)*

3. Singleton Generalized Arc Consistency *(1 point)*

3 Global Consistency Properties for CSPs

Define, formally or informally but as clearly as you can, the global consistency properties below:

1. Minimality *(1 point)*

2. Decomposability *(1 point)*