

Foundations of Constraint Programming

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Exercise 7.1

Given a CSP with the variables x_1, \dots, x_n linearly ordered by \prec and the corresponding variable domains D_1, \dots, D_n non-empty, prove the following (cf. Slide VII/8):

- a) The number of nodes in the complete labeling tree associated with \prec is

$$1 + \sum_{i=1}^n (\prod_{j=1}^i |D_j|).$$

- b) The complete labeling tree has the least number of nodes if the variables are ordered by their domain sizes in increasing order.

Exercise 7.2

Consider the following CSP C together with the variable ordering $x \prec y \prec z$:

$$\langle x \neq y, y > z, x < z; x \in \{1, 2, 3\}, y \in \{1, 2, 3\}, z \in \{2, 3, 4\} \rangle$$

- a) Give a *prop* labeling tree associated with C (cf. Slide VII/13-14) for each of the three constraint propagation methods Forward Checking, Partial Look Ahead and MAC (Full Look Ahead).
- b) How are the trees from a) processed by the two algorithms “Backtrack-free Search with Constraint Propagation” and “Backtracking with Constraint Propagation”?

Exercise 7.3

Questioning hour: Think about questions that you still have regarding the exercises in this course.