

Principles of AI Planning

Prof. Dr. B. Nebel, Dr. R. Mattmüller
 D. Speck, T. Schulte, M. Kantz
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University of Freiburg
 Department of Computer Science

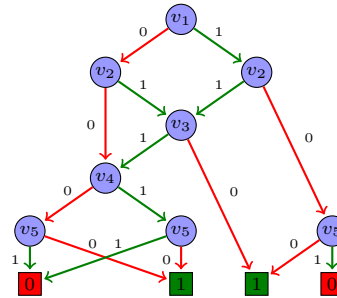
Exercise Sheet 12

Due: Friday, January 31th, 2020

Send your solution to mario.kantz@gmail.com (PDF only) or submit a hardcopy before the lecture. The exercise sheets may and should be worked on and handed in in groups of two or three students. Please indicate all names on your solution.

Exercise 12.1 (BDDs, 4 points)

Let B be the BDD over the variables v_1, \dots, v_5 depicted on the right. Reduce B as much as possible. Give intermediate results after each reduction step. Give representations of B as a formula in conjunctive normal form and as a set of states.



Exercise 12.2 (Planning with BDDs, 1+1+2+2 points)

Let $\Pi = \langle V, I, O, \gamma \rangle$ be a propositional planning task with the following components.

- $V = \{v_1, v_2, v_3\}$
- $I(v_1) = 1, I(v_2) = 0$ and $I(v_3) = 0$
- $O = \{o_1, o_2\}$
 - $o_1 = \langle v_1, v_2 \wedge \neg v_3 \rangle$
 - $o_2 = \langle v_2, \neg v_2 \wedge v_3 \rangle$
- $\gamma = v_3$

Furthermore, we assume a variable order $v_1 \prec v'_1 \prec v_2 \prec v'_2 \prec v_3 \prec v'_3$.

- Draw the reduced ordered BDD for I , i.e., $\text{bdd-singleton}(I)$.
- Draw the reduced ordered BDD for γ , i.e., $\text{bdd-formula}(\gamma)$.
- Draw the reduced ordered BDD for o_1 and o_2 , i.e., $\text{bdd-formula}(\tau_V(o_1))$ and $\text{bdd-formula}(\tau_V(o_2))$.
- Describe the next steps necessary to find a solution based on the symbolic representation of planning task Π created in (a)-(c). In other words, describe the idea of symbolic breadth-first search by means of planning task Π .