

AI midterm exam, 2011. nov. 2., 9-10

A/1. What is the definition of partial observability? Draw an appropriate agent architecture for a partially observable environment and explain which part is a consequence of the partially observable property (10p)

A/2. What is an admissible heuristics? Give an example and a counterexample (5p)

A/3. Give examples for search methods with different space and time complexity (use the maximum branching factor b , depth of least cost solution d , and maximum depth of diameter m). Explain the properties of the iterative deeping search (10 p)

A/4. Find an optimal solution using A* in the search tree below. S denotes the initial state, G indicates goal states, the heuristic values of the states are shown in the nodes, costs of actions are indicated along the edges. (10p)

A/5. Define completeness and soundness in theorem proving. Give an example. (5p)

A/6. Decide with truth-table what is the status of the following statements (not satisfiable, satisfiable, or valid): (10p)

a. $(\text{Smoke} \Rightarrow \text{Fire}) \Rightarrow (\neg \text{Smoke} \Rightarrow \neg \text{Fire})$

b. $\text{Big} \vee \text{Silent} \vee (\text{Big} \Rightarrow \text{Silent})$

A/7. Tim, Neal és Elisabeth are Club members. Club members are hiker or skier. Hikers do not like rain, skiers like snow. Elisabeth does not like what Tim likes, and she likes what Tim does not like. Tim likes rain and snow. Is there any club member who is hiker, but not skier? Answer this question with resolution!

$H(x)$ denotes that x is Hiker, $S(x)$ denotes that x is a skier, $L(x,y)$ denotes that x likes y (if x is a club member and y denotes rain or snow): (10p)

1. $\forall x. S(x) \vee H(x)$
2. $\neg \exists x. H(x) \wedge L(x, \text{Rain})$, which is $\forall x. \neg H(x) \vee \neg L(x, \text{Rain})$
3. $\forall x. S(x) \rightarrow L(x, \text{Snow})$, which is $\forall x. \neg S(x) \vee L(x, \text{Snow})$
4. $\forall y. L(\text{Elisabeth}, y) \leftrightarrow \neg L(\text{Tim}, y)$, which is 4a: $\forall y. \neg L(\text{Elisabeth}, y) \vee \neg L(\text{Tim}, y)$ and 4b...
5. $L(\text{Tim}, \text{Rain})$
6. $L(\text{Tim}, \text{Snow})$
7. **question: $\exists x. H(x) \wedge \neg S(x)$, which is $\forall x. \neg H(x) \vee S(x)$**
8. **4a+6: $\neg L(\text{E}, \text{Snow})$**
9. **1+7: $S(x)$**
10. **3+9: $L(x, \text{Snow})$**
11. **8+11: nil**

