
Artificial Intelligence

7. February 2013

The following exercises are written down from memory and may be formulated inexactly.

PROBLEM 1

- With which h is A* equal to Uniform cost search?
- What does the alpha and beta in alpha-beta-search?
- Why is Decision Tree learning used although the bad results in PAC Theory?
- How does the POP Algorithm handle threats?
- What is the Markov assumption?

PROBLEM 2

- Apply A* on a graph given $h(n)$ and edge weights
- What is the optimal solution? (Note: A* did not find optimal solution on given graph)
- Give a heuristic such that A* finds optimal solution.

PROBLEM 3

- Apply Min-Max on a Search-Tree
- Perform alpha-beta-pruning and write down final alpha, beta values for each node

PROBLEM 4

Barber Problem: The barber shaves exactly everyone who doesn't shave himself.

- a) Formalize the problem in first order logic.
- b) The Problem is a paradoxon and therefore unsatisfiable. Is it possible to show this with resolution? Justify your answer, don't do any resolution.
- c) Proof semantically that the formula is unsatisfiable.

PROBLEM 5

- a) Perform resolution on an entailment in propositional logic or give counter example if entailment does not hold.
- b) Perform resolution on an entailment in first order logic or give counter example if entailment does not hold.
- c) Find the most general unifier, writing down the DS and unifier for all steps.

PROBLEM 6

STRIPS: A robot in a factory with a polishing machine.

At(x) - robot is at x

Holding(x) - robot holds x

Shiny(x) - x is shiny

OnShelf(x) - x is on the shelf

Possible actions are: Go(x,y), Polish(x), PutShelf(x)

There is a machine, a shelf and a piece of working material. Initially the robot is at the shelf and holds the working material.

The Goal ist, that the working material is polished and on the shelf.

Also there was a text describing the preconditions and effects of all actions.

- a) Give strips operations for the actions and the initial state and the goal state.
- b) Use the POP algorithm (order in which actions should be added was given). Mark conflicts and show how the conflicts are handled.

PROBLEM 7

Given a Belief Network.

- a) Calculate one probability (not completely easy, definitely need Bayes rules, perhaps normalization)
- b) Give a set E that d-seperates A from D (where A and D a nodes in the given belief network. Justify your answer.

PROBLEM 8

Given 8 examples with 3 attributes, perform decision tree learning (I values where given for all I's except $I(0.5,0.5)$ and $I(1,0)$ which one should have in mind).