

T-93.4400 Tekoälyn perusteet

1. Describe the behaviour of depth-first, breadth-first and uniform-cost search, and compare their relative advantages and disadvantages. (2 points)

How does “informed search” try to improve on “uninformed search”? (2 points)

Explain how A* search works, what its advantages are, and identify any restrictions on heuristics which can be used with it. (2 points)

2. Write a pseudocode implementation of the MINIMAX algorithm. (4 points)

What is the maximum level of ply would be feasible for MINIMAX on a computer which could process 1000 evaluations per second in a game which had a maximum branching factor of 40, and where moves had to be completed within 2 minutes? (2 points)

3. Jones, Smith, and Clark hold the jobs of programmer, knowledge engineer, and manager (not necessarily in that order). Jones owes the programmer \$10. The manager’s spouse prohibits borrowing money. Smith is not married. Your task is to figure out which person has which job.

Represent the facts in propositional logic. You should have nine propositional symbols to represent the possible person/job assignments. For example, you might use the symbol SM to indicate that Smith is the manager. You do not need to represent the relation between owing and borrowing, or being married and having a spouse; you can just use these to draw conclusions (e.g. from “Smith is not married” and “the manager’s spouse” we know that Smith cannot be the manager, which you can represent as **not** SM). The conjunction of all the relevant facts forms a sentence, which you can call KB. The possible answers to the problem are sentences like JP **and** SK **and** CM. There are six such combinations of person/job assignments. Solve the problem by showing that only one of them is implied by KB, and by saying what its interpretation is.

4. Explain why it is a good heuristic to choose the variable that is most *constrained*, but the value that is *least* constraining in a CSP search.

5. Let us consider the following planning problem. In the start state Rocket1, Parcel1, and Parcel2 are on the Earth. In the goal state Parcel1 and Parcel2 are on the Moon and Rocket1 is on the Earth. We have at our disposal three operators Load(parcel, rocket), Unload(parcel, rocket), and Fly(rocket, starting-point, destination), which may be divided into two operators (for flying loaded and flying unloaded), if needed. The capacity of Rocket1 is one parcel, i.e. only one parcel can be carried at a time – not two parcels. Define the operators as STRIPS- operator schemas, code the problem using these STRIPS-operators, and solve the problem in the POP-planner style. (You do not need to write down the POP (Partial-Order Planner) code, only to show, e.g. through pictures, how the solving of this problem goes.