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I6 - Robotics & Embedded Systems
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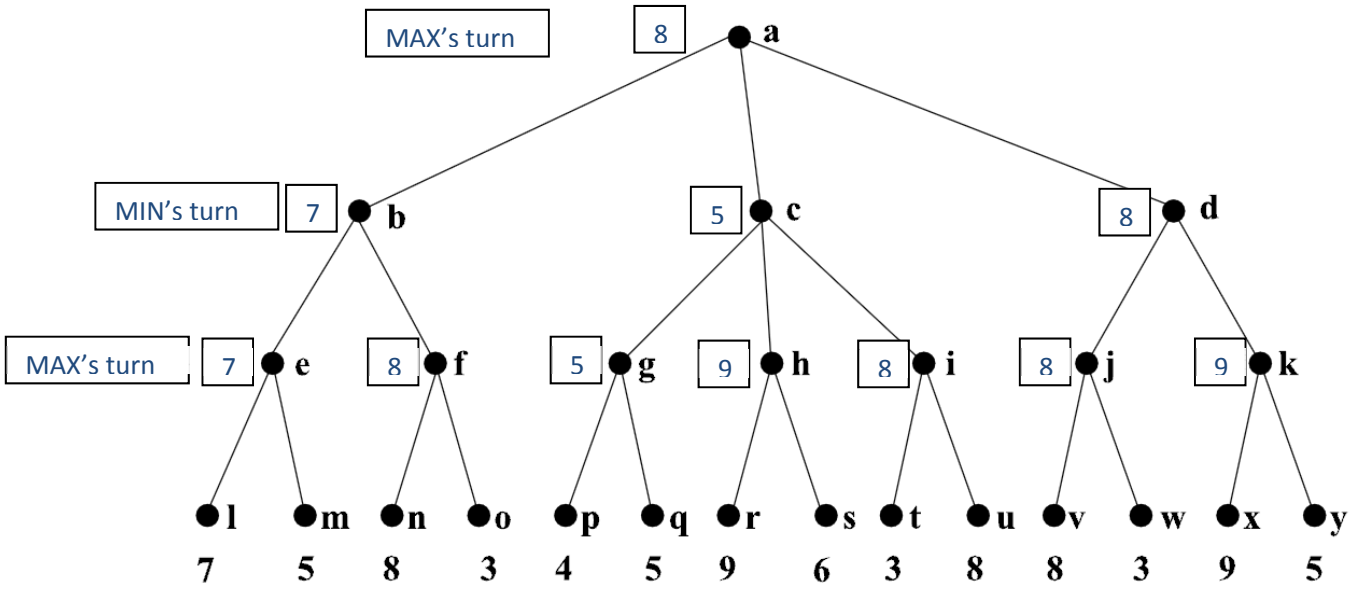
Exercises for the Lecture

Techniques in Artificial Intelligence

10.12.2012 – Sheet 2

1) Adversarial Search, α-β-pruning

Consider the following search graph, player MAX starts at A.



a) What is the MiniMax-value of node A?

8, see MiniMax values added above.

b) Show the steps of an α-β-search including the update of [min,max] and show the nodes not visited. Please write down the updates in the form a <- [min,max]. The search order is left-to right.

a ← [-∞, ∞]

b ← [-∞, ∞]

e ← [-∞, ∞]

e ← [7, ∞] update after visiting l, visiting m does not change the value

b ← [-∞, 7] as it's MIN's choice on that level and therefore MIN can limit MAX's reward to 7

f ← [-∞, 7] propagated down, then after visiting n, value is kept as MIN would not choose that path, and node o is pruned as 8 > 7, which is the current cut-off value.

a ← [7, ∞] MAX can get at least a reward of 7 by choosing b as first move

c ← [7, ∞] propagated down

g ← [7, ∞] after visiting p and q,

nodes h, r, l, s, t, u are pruned because MIN would choose g or even a branch with lower maximum value if MAX's choice was c

d ← [7, ∞] propagated down

j ← [7, ∞] propagated down

j ← [8, ∞] updated after visiting v

d ← [7, 8]

k ← [7, 8] propagated down, not updated after visiting x

y is pruned because MIN would not choose k

d ← [8, 8] as the tree is completely explored

a ← [8,8]

c) What is the sequence of actions given that both players act optimally? Explain.

Player MAX starts in a and chooses d (max. reward of {7,5,8}), then MIN selects j (min of {8,9}), and finally MAX chooses v (max of {8,3}).

d) Is it possible that in α-β-search all nodes as in Minimax need to be visited? Explain.

Yes, if the order of nodes is wrongly chosen, so that nothing can be pruned