

2nd Midterm Exam

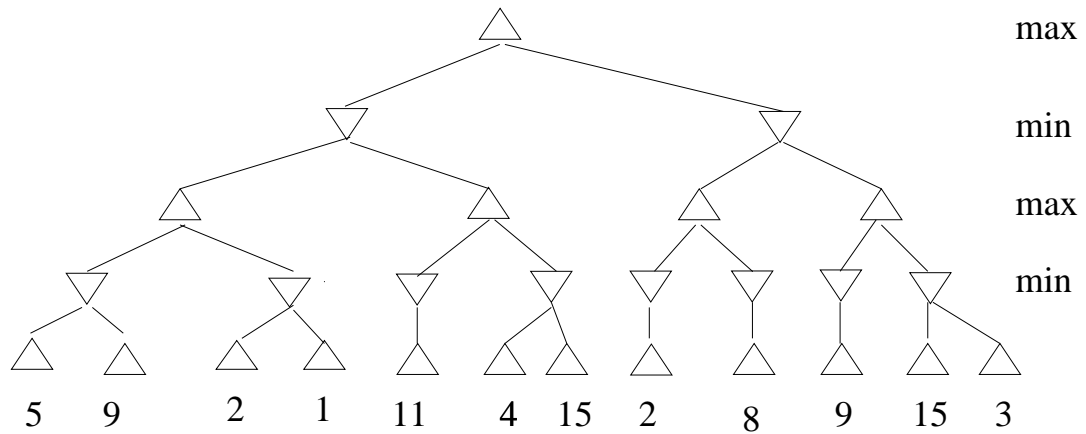
Tuesday April 8

75 minutes == 75 points

Open book and notes

1. *15 points*

Show the backed-up values for all the nodes in the following game tree and show the branches that are pruned by alpha-beta. For each branch pruned, explain briefly why alpha-beta prunes it. Follow the convention used in the textbook to examine the branches in the tree from left to right.



2. *15 points*

Prove by resolution that the following set of propositional clauses is unsatisfiable:

$$\neg P \vee \neg Q \vee R$$

$$\neg S \vee Z$$

$$\neg Z \vee P$$

$$S$$

$$\neg R$$

$$\neg S \vee U$$

$$\neg U \vee Q$$

3. *10 points*

1. When doing constraint propagation, is backtracking search more efficient than generating and testing each combination of values? why? or why not?

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2. what are the advantages and disadvantages of using a complete-state formulation for CSP instead of using an incremental formulation?

4. 15 points

1. Write the following statements in predicate calculus:
 1. Horses are faster than dogs.
 2. Greyhounds are dogs.
 3. There is a greyhound that is faster than every rabbit.
 4. Amigo is a horse and Bunny a rabbit.
 5. faster is transitive, i.e. if x is faster than y and y is faster than z then x is faster than z.
2. Convert them to conjunctive normal form. Pay attention to how you skolemize the existentially quantified variable in 3. Recall that a Skolem constant cannot be unified with another constant except itself, but it can be unified with a variable.
3. Prove by resolution that “Amigo is faster than Bunny.”

5. 20 points

For each of the following sentences, decide if the logic sentence given is a correct translation of the English sentence or not. If not explain briefly why not and correct it:

1. There is exactly one house in Minneapolis whose cost is \$300,000.
$$\exists x \text{ house}(x) \wedge \text{in}(x, \text{Minneapolis}) \wedge \forall y [\text{house}(y) \wedge \text{in}(y, \text{Minneapolis}) \wedge \text{cost}(y) = 300000 \Rightarrow x = y]$$
2. Any house in Minneapolis costs less than any apartment in New York.
$$\forall x [\text{house}(x) \wedge \text{in}(x, \text{Minneapolis})] \Rightarrow [\exists y \text{ apartment}(y) \wedge \text{in}(y, \text{NewYork}) \wedge \text{cost}(x) < \text{cost}(y)]$$
3. Some apartments in Minneapolis cost less than some houses in New York.
$$\forall x [\text{apartment}(x) \wedge \text{in}(x, \text{Minneapolis}) \wedge \exists y \text{ house}(y) \wedge \text{in}(y, \text{NewYork})] \Rightarrow \text{cost}(x) < \text{cost}(y)$$
4. All houses have at least one bathroom.
$$\forall x [\text{house}(x) \wedge \exists y \text{ bathroom}(y)] \Rightarrow \text{in}(x, y)$$
5. There is a house in Minneapolis which costs more than any other house.
$$\forall x [\text{house}(x) \wedge \text{in}(x, \text{Minneapolis})] \Rightarrow [\exists y \text{ house}(y) \wedge \text{cost}(y) > \text{cost}(x)]$$

YOU REACHED THE END OF THE EXAM