CSci 5511 Spring 2003

Final Exam

Tuesday May 13

120 minutes == 120 points

open book and notes

1. *30 points – 10 each*

    1. Represent the following sentences in predicate calculus:
        1. There are at least two cats who live in the village.
        2. All cats who live in the village know each other.
        3. Some persons hate all cats who eat birds.
        4. Felix is a cat.
        5. Felix ate a bird.
    2. Convert each of them to conjunctive normal form, skolemizing as needed.
    3. Prove by resolution that "there is someone who hates Felix."

2. *10 points*

    Prove that

    $[A \Rightarrow \neg B] \models [A \wedge B \Rightarrow C]$

3. *15 points* You are given the following pairs of clauses where upper case letters indicate constants, lower case letters indicate variables, functions, or predicates. Consider each pair independently of the others. In each pair variables with the same name are meant to be the same variable.

    For each of the pairs specify if they can be resolved. If yes, show the results of the unification process in the form {u/v} to mean that u is replaced by v. If not, explain briefly why.

    1. $p(x, f(x))$ with $\neg p(A, f(z))$
    2. $p(x, A)$ with $\neg p(A, y)$
    3. $p(f(A), y, B)$ with $\neg p(f(x), x, z)$
    4. $q(A, f(x, B))$ with $\neg q(y, f(A, y))$
    5. $q(f(A), x)$ with $\neg q(y, f(y))$
    6. $q(x, B)$ with $\neg q(A, f(y))$
    7. $p(f(A, x))$ with $\neg p(f(z, f(B, z)))$

TURN TO THE NEXT PAGE FOR MORE QUESTIONS

4. *40 points – 10 each*

   An ATM (Automated Teller Machine) will give you money if you have an ATM card. You can get food in exchange for money. You have an ATM card. Your goal is to have food and money.

   1. Write operators for the problem domain described above using the STRIPS notation.
   2. Rewrite the operators using the situation calculus notation.
   3. Show the levels S_0, A_0, and S_1 of the corresponding planning graph.
   4. Show the plan that a partial order planner could construct to achieve your goal.

5. *25 points – 5 each*

   Answer the following questions briefly but precisely. Justify your answers.

   1. Can a problem exist for which there exists a partially ordered plan but not a totally ordered plan?
   2. Is it possible that alpha-beta and minimax return different results on the same problem?
   3. Are semantics networks more expressive than predicate calculus?
   4. Is there a way of making A* to behave like breadth-first search?
   5. Is is true that A* is slower than hill-climbing?

YOU REACHED THE END OF THE EXAM