CSE 473: Artificial Intelligence

Assignment #3

Due: Monday, October 30, 2006

Reading Assignment: Read Chapters 6-8.

Problems:

1. (Chapter 6) [35 points] Exercise 6.1, all parts.

2. (Chapter 7) [17 points] (Based on "The Adventure of Silver Blaze," an original Sherlock Holmes mystery by Arthur Conan Doyle) A prize-winning racehorse named Silver Blaze has been stolen from a stable, and a bookmaker named Fitzroy Simpson has been arrested as the prime suspect by good old Inspector Gregory. Sherlock Holmes, however, after ample use of his magnifying glass and some of the strongest black tobacco this side of the Atlantic, finds the true thief by reasoning from the following premises:

   a) The horse was stolen either by Fitzroy or by its trainer John Straker.
   b) The thief had to have entered the stable the night of the theft.
   c) If a stranger enters the stable, the dog barks.
   d) Fitzroy was a stranger.
   e) The dog did not bark.

   Who stole Silver Blaze? Prove your assertion using the technique of resolution. Construct your resolution proof using only the following proposition symbols:
ThiefFitzroy	ThiefJohn
EnteredStableFitzroy	EnteredStableJohn
StrangerFitzroy	StrangerJohn
BarksDog	

3. (Chapter 7) [15 points] Your neighborhood car mechanic has found out from undisclosed sources that you are taking an AI course and has asked you to build an expert system for diagnosing automobile problems. She has provided you with the following facts to be entered into the knowledge base of the expert system:
   - If there is gas in the tank and the fuel line is okay, then there is gas in the engine;
   - If there is gas in the engine and a good spark, the engine runs;

- If there is power to the plugs and the plugs are clean, a good spark is produced;
- If the battery is charged and the cables are okay, then there is power to the plugs.

a. Convert the facts above to Horn clauses. Use proposition symbols such as GasInTank, FuelLineOK, GasInEngine, etc.
b. Construct an AND-OR graph for the knowledge base in (a) above.
c. Suppose it is known that there is gas in the tank, the battery is charged, the fuel line and cables are both okay, and the plugs are clean. Prove using Forward Chaining that the engine runs: show the contents of the list *agenda* in the forward chaining algorithm in Figure 7.14 in the text, <u>after initialization and after each iteration of the *for* loop</u>.

4. (Chapter 8) [33 points] Exercise 8.6, all parts. Use the following vocabulary:
F: French course
G: Greek course
Spring2001: the quarter Spring 2001
UK: the country UK
Birth: a reason for citizenship
Descent: a reason for citizenship
x > y : x is greater than y
Takes(x,c,q): student x takes course c in quarter q
Passes(x,c,q): student x passes course c in quarter q
Score(x,c,q): the score obtained by student x in course c in quarter q
Buys(x,y,z): x buys y from z
Sells(x,y,z): x sells y to z
Shaves(x,y): person x shaves person y
Born(x,c): person x is born in country c
Parent(x,y): x is a parent of y
Citizen(x,c,r): x is a citizen of country c for reason r
Resident(x,c): x is a resident of country c
Fools(x,y,t): person x fools person y at time t
Student(x), Person(x), Man(x), Barber(x), Expensive(x), Agent(x), Insured(x), Smart(x), Politician(x): predicates satisfied by members of the corresponding categories