CSCE 580 Spring 2003
MIDTERM EXAM
Wednesday 2003-02-21—Two Pages, Closed Book

1 History and Intelligent Agents—12 points

1. (4 points) What are the four categories of definitions of Artificial Intelligence given in the book? **Answer:** Systems that {think, act} {like humans, rationally}.
2. (1 point) What important event in the history of AI happened in 1956? **Answer:** The Dartmouth workshop where, amonf other things, the name Artificial Intelligence, proposed by John McCarthy, was adopted.
3. (1 point) There are two major programming languages that are used in AI programming, for good reasons. One is Prolog. What is the other one? **Answer:** LISP.
4. (2 points) Define *rational agent.* **Answer:** See p. 36 of textbook
5. (4 points) Russell and Norvig define four kinds of agent programs in Chapter 2 of their textbook. What are they? **Answer:** Simple reflex, model based, goal based, and utility based.

2 Prolog—23 points

1. If it exists, give the most general unifier for:
   (a) (2 points) `f(s(s(s(X))))` and `(f(s(s(s(s(Y))))`. **Answer:** {X \ s(Y)} There is an error in the formatting of two terms. The correct terms are `f(s(s(s(X))))` and `f(s(s(s(s(Y)))))`.
   (b) (3 points) `knows(john,X)` and `knows(Y,mother(Y))` **Answer:** {Y \ john, X \ mother(john)}
   (c) (3 points) `q(Y,g(a,b)` and `q(g(X,X),Y)` **Answer:** Does not exist
2. (5 points) Write a program for the ancestor relation[1] (called "predecessor" in your textbook.) Assume that the parent relation is already defined. Make sure that the program is both declaratively and procedurally correct. **Answer:** ancestor(X,Y) :- parent(X,Y). ancestor(X,Y) :- parent(X,Z), ancestor(Z,Y).

[1] For the purpose of this exam, "relation" and "predicate" are used interchangeably.

3. (5 points) Define the predicate `reverse( List, ReverseList)`, with the obvious meaning. Assume that the predicate `conc(L1,L2,L3)` (list concatenation, also known as `append`) described in class is already defined. **Answer:** rev([],[]). rev([H|T],Z) :- rev(T,T1), append(T1,[H],Z).

4. (5 points, exercise 3.5[B], modified) Define the predicate `palindrome( List)`. A list is a palindrome if it reads the same in the forward and backward direction. For example, `[m,a,d,a,m]`. Assume that `List` contains only constants. **Answer:** palindrome([]). palindrome(L) :- reverse(L, L1), L = L1. Also (Bratko): palindrome([]). palindrome([A]). palindrome(L) :- append([First|Middle], [First], List), palindrome(Middle).