Prolog (Programming in Logic)

- Prolog is a programming language (developed in 1970 by Alain Colmerauer) based on the resolution principle.
- It uses the syntax of predicate logic to perform symbolic and logical computations.
- Programming is accomplished by creating a database of facts and rules about objects, their properties, and their relationships to other objects.
- Queries can be posed about objects and valid conclusions will be determined and returned by the program.
- Responses to user queries are determined through a form of inferencing control known as resolution.

Prolog (Programming in Logic) Cont.

- Facts in Prolog are declared with predicates and constants written in lowercase letters.
- The arguments of predicates are enclosed in parentheses and separated with commas. For example,

  sister(sue, bill).

  parent(ann,sam).

  parent(joe,ann).

  male(joe).

  female(ann).
- Rules in Prolog are composed of a condition "if" part and a conclusion "then" part separated by the symbol ":-"
- Rules are used to represent general relations which hold when all of the conditions in the "if" part are satisfied.
- Rules may contain variables, which must begin with uppercase letters.

Prolog (Programming in Logic) Cont.

Example of a Rule in Prolog:

grandfather(X,Z):- parent(X,Y), parent(Y,Z), male(X).

Queries:

?-grandfather(X,Y)

X=joe, Y=sam

Monkey-Banana problem

```
% Author: M. S. Uddin   % Date: 7/13/2006
% Monkey and bananas problem
% Constants
% {floor, chair, monkey, bananas}
% Variables
% {X, Y, Z}
% Predicates
% {canreach(X,Y)     ; X can reach Y
% dexterous(X)       ; X is a dexterous animal
% near(X,Y)          ; X is near to Y
% geton(X,Y)         ; X can get on Y
% under(X,Y)         ; X is under Y
% tall(X)            ; X is tall
% inroom(X)          ; X is in the room
% canmove(X,Y,Z)     ; X can move Y near Z
% canclimb(X,Y)      ; X can climb onto Y
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% Axioms:
inroom(bananas).
inroom(chair).
inroom(monkey).
dexterous(monkey).
tall(chair).
canmove(monkey,chair,bananas).
canclimb(monkey,chair).
canreach(X,Y):-
    dexterous(X), near(X,Y).
near(X,Z):-
    geton(X,Y), under(Y,Z), tall(Y).
geton(X,Y):-
    canclimb(X,Y).
under(Y,Z):-
inroom(X), inroom(Y), inroom(Z), canmove(X,Y,Z).
```

Creation of knowledge base for solving a problem

In creating a knowledge base, it is needed the following steps:

- Identify all relevant objects, which will play some role in the anticipated inferences.
- Irrelevant objects should be omitted, but never at the risk of incompleteness.
- Establish important properties of objects, relations and assertions that means facts and rules.