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Title of Experiment :

Write simple programs using PROLOG as an AI programming Language

Objective of Experiment :

To implement knowledge representation and reasoning in AI language

Outcome of Experiment :

Implement simple programs using Prolog.

Problem Statement :

Write simple programs using PROLOG as an AI programming Language

- I. Family tree
- II. Tower of hanoi

Description / Theory :

Prolog or **PRO**gramming in **LOG**ics is a logical and declarative programming language. It is one major example of the fourth generation language that supports the declarative programming paradigm. This is particularly suitable for programs



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that involve **symbolic** or **non-numeric computation**. This is the main reason to use Prolog as the programming language in **Artificial Intelligence**, where **symbol manipulation** and **inference manipulation** are the fundamental tasks.

In Prolog, we need not mention the way how one problem can be solved, we just need to mention what the problem is, so that Prolog automatically solves it. However, in Prolog we are supposed to give clues as the **solution method**.

Prolog language basically has three different elements –

Facts – The fact is predicate that is true, for example, if we say, “Tom is the son of Jack”, then this is a fact.

Rules – Rules are extensions of facts that contain conditional clauses. To satisfy a rule these conditions should be met. For example, if we define a rule as –

grandfather(X, Y) :- father(X, Z), parent(Z, Y)

This implies that for X to be the grandfather of Y, Z should be a parent of Y and X should be father of Z.

Questions – And to run a prolog program, we need some questions, and those questions can be answered by the given facts and rules.

Some Applications of Prolog

Prolog is used in various domains. It plays a vital role in automation system. Following are some other important fields where Prolog is used –

- Intelligent Database Retrieval
- Natural Language Understanding
- Specification Language
- Machine Learning
- Robot Planning
- Automation System
- Problem Solving



Algorithm/ Pseudo Code/ Flowchart :

Tower Of Hanoi Algorithm

1. Move n-1 discs from A to B using C
2. Move a disk from A to C
3. Move a disk from B to C using A

Program :

Code

```
female(swara).  
female(monisha).  
female(aditi).  
female(preasha).  
female(nikhili).  
female(kinari).  
female(teena).  
female(bhagyashri).  
female(mrunal).  
female(madhura).
```

```
male(nuren).  
male(dyotak).  
male(yash).  
male(dhruv).  
male(mandar).  
male(mayur).  
male(nishant).  
male(pranav).  
male(nandan).  
male(mukund).
```

```
parent(mandar,dyotak).  
parent(nikhili,dyotak).  
parent(mandar,nuren).  
parent(nikhili,nuren).
```

```
parent(kinari,yash).  
parent(pranav,yash).  
parent(kinari,swara).
```



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```
parent(pranav,swara).
```

```
parent(nishant,monisha).  
parent(tina,monisha).  
parent(nishant,preesha).  
parent(teenaa,preesha).
```

```
parent(mayur,dhruv).  
parent(bhagyashri,dhruv).  
parent(mayur,aditi).  
parent(bhagyashri,aditi).
```

```
parent(mukund,mandar).  
parent(madhura,mandar).  
parent(mukund,mayur).  
parent(madhura,mayur).
```

```
parent(nandan,nikhili).  
parent(mrunal,nikhili).  
parent(nandan,nishant).  
parent(mrunal,nishant).  
parent(nandan,kinari).  
parent(mrunal,kinari).
```

```
mother(X,Y):- parent(X,Y),female(X).  
daughter(Y,X):- parent(X,Y),female(Y).  
father(X,Y):-parent(X,Y),male(X).  
son(Y,X):-parent(X,Y),male(Y).  
sister(X,Y):-parent(Z,X),parent(Z,Y),female(X),X\==Y.  
brother(X,Y):-parent(Z,X),parent(Z,Y),male(X),X\==Y.  
grandparent(X,Y):-parent(X,Z),parent(Z,Y).  
grandmother(X,Z):-mother(X,Y),parent(Y,Z).  
grandfather(X,Z):-father(X,Y),parent(Y,Z).  
wife(X,Y):-parent(X,Z),parent(Y,Z),female(X),male(Y).  
kaka(X,Z):-brother(X,Y),father(Y,Z).  
mama(X,Z):-brother(X,Y),mother(Y,Z).  
kaki(X,Z):-wife(X,Y),kaka(Y,Z).  
mami(X,Z):-wife(X,Y),mama(Y,Z).
```

Output

```
1 ?- [family].  
true.
```



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2 ?- son(dyotak,nikhili).
true.

3 ?- brother(mandar,mayur).
true.

4 ?- grandfather(nandan,preesha).
true.

5 ?- grandfather(mukund,yash).
false.

6 ?- grandfather(mukund,dhruv).
True.

7 ?- brother(nuren,dhruv).
false.

8 ?- brother(nuren,dyotak).
True

Code

```
mov(1, X, Y, _) :-  
    write('Move top from '),  
    write(X),  
    write(' to '),  
    write(Y),  
    nl.  
mov(N,X,Y,Z) :-  
    N>1,  
    M is N-1,  
    mov(M,X,Z,Y),  
    mov(1,X,Y,_),  
    mov(M,Z,Y,X).
```

Output

8 ?- [toh].
true.

9 ?- mov(4,source,target,mid).



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```
Move top from source to mid
Move top from source to target
Move top from mid to target
Move top from source to mid
Move top from target to source
Move top from target to mid
Move top from source to mid
Move top from source to target
Move top from mid to target
Move top from mid to source
Move top from target to source
Move top from mid to target
Move top from source to mid
Move top from source to target
Move top from mid to target
true
```

Result and Discussion :

Thus we have successfully implemented family tree and tower of hanoi in Prolog. We we were successfully able to implement knowledge representation and reasoning in AI language.