

Principles of Artificial Intelligence

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Lecture one:

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1. Introduction to prolog language

Prolog: is a computer programming language that is used for solving problems involves objects and relationships between objects.

Example:

“John owns the book”

Owens (john,book) relationship(object1,object2)

The relationship has a specific order, johns own the book, but the book dose not owns john, and this relationship and its representation above called fact.

◆we are using rule to describe relationship between objects.

Example: the rule” two people are sisters if they are both female and have the same parents”

1. Tell us something about what it means to be sisters.
2. Tell us how to find if two people are sisters, simply: check to see if They are both female have the same parents.

Component of computer programming in prolog

Computer programming in prolog consist of:

1. Declaring some facts about object and their relationships.
2. Defining some rules about objects and their relationships.
3. Asking questions about objects and their relationships.

if we write our rule about sisters, we could then ask the questions whether Mary and Jane are sisters.

Prolog would search through what we told it about Mary and Jane, and come back with the answer Yes or No, depending on what we told it earlier.

So, we can consider prolog as a store house of facts and rules, and it uses

the facts and rules to answer questions.

◆prolog is a conversational language. Which means you and the computer carry out a kind of conversation, typing a letter from keyboard and displaying it at the screen, prolog work like this manner, prolog will wait for you to type in facts and rules that certain to the problem you want to solve? Then if you ask the right kind of questions prolog will work out the answers and show them.

2. Some of prolog language characteristics:

1. We can solve a particular problem using prolog in less no of line of code.
2. It's an important tool to develop AI application and ES.
3. Prolog program consist of fact and rule to solve the problem and the output is all possible answer to the problem.
4. Prolog language is a descriptive language use the inference depend on fact and rule we submit to get all possible answer while in other language the programmer must tell the computer on how to reach the solution by gives the instruction step by step.

3. Prolog language uses:

1. Construct NLI (Natural Language Interface).
2. Translate language.
3. Constructor symbolic manipulation language packages.
4. Implement powerfully database application.
5. Construct expert system programs.

4. Prolog language component

4.1 Facts

Is the mechanism for representing knowledge in the program.

Syntax of fact:

1. The name of all relationship and objects must begin with a lower-case letter, for example likes (john, mary).
2. The relationship is written first, and the objects are written separated by commas, and enclosed by a pair of round brackets.
Like (john, mary)
3. The full stop character '.' Must come at the end of fact.

Example:

Gold is valuable valuable (gold).

Jane is female female (jane).

John owns gold owns (johns, gold).

Johns is the father of Mary father (john, marry).

The names of objects that are enclosed within the round brackets are called arguments. And the name of relationship called predicates

Relationship has arbitrary number of argument. If we want to define predicate called play, were we mention two players and a game they play with each other, it can be:

Play (john, Mary, football).

In prolog the collection of facts is called database.

4.2 Rules

Rules are used when you want to say that a fact depends on a group of other facts, and we use the following syntax:

1. One fact represents the head (conclusion).
2. The word if used after the head and represented as “:-”.
3. One or more fact represents the requirement (condition).

The syntax of if statement

If (condition) then (conclusion)

[Conclusion: - condition] rule

Example:

I use the umbrella if there is rain

Conclusion condition

Represent both as fact like:

Wheatear (rain).

Use (umbrella)

Use (Iam, umberella):-whether (rain).

4.3 Questions

Question used to ask about facts and rules.

Question look like the fact and written under the goal program section while fact and rule written under clauses section.

Example: for the following fact owns (mary , book).

We can ask:does mary own the book in the following manner:

Goal:

Owens (mary ,book)

When Q is asked in prolog, it will search through the database you typed before, it look for facts that match the fact in the question.

Two fact matches if their predicates are the same and their corresponding argument are the same, if prolog finds a fact that matches the question, prolog will respond with Yes, otherwise the answer is No.

5. Variables

If we want to get more interest information about fact or rule, we can use variable to get more than Yes/No answer.

*variables dose not name a particular object but stand for object that we cannot name.

*variable name must begin with capital letter.

*using variable we can get all possible answer about a particular fact or rule.

*variable can be either bound or not bound.

Variable is bound when there is an object that the variable stands for.

The variable is not bound when what the variable stand for is not yet known.

Example:

Fact

Like (john, mary).

Like (john, flower).

Like (ali, mary).

Question:

1. Like (john,X)

X= mary

X = flower

2. like(X, mary)

X=john

3. Like(X, Y)

1

X=john Y=flower

X=john Y=mary

X=ali Y=mary

5. Type of questing in the goal

There are three type of question in the goal summarized as follow:

1. Asking with constant: prolog matching and return Yes/No answer.

2. Asking with constant and variable: prolog matching and produce result for the Variable.

3. Asking with variable: prolog produce result.

Example:

Age(a,10).

Age(b,20).

Age(c,30).

Goal:

1.Age(a,X). ans:X=10 Type2

2.age(X,20). Ans:X=b Type2

3.age(X,Y). ans: X=a Y=10, X=b Y=20, X=c Y=30.

Type3

4.Age(_,X). ans:X=10 , X=20, X=30. ‘_’ means don’t care

Type3

5.Age(.,.). Ans:Yes Type1
2

H.W:

Convert the following paragraph into fact or rule:

- 1. a person may steal something if the person is a thief and he likes the thing and the thing is valuable.*
- 2. Bob likes all kind of game. Football is a game. Anything anyone plays and not killed by is a game.*