Syntax and Semantics of Prolog

🧠 Knowledge Representation in Prolog

Prolog is a logic programming language used to represent and reason about knowledge in AI systems. It uses facts, rules, and queries to encode information and derive conclusions.

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1. 📜 Syntax and Semantics of Prolog

➤ Syntax

- **Atoms: lowercase words or single-quoted strings (john, 'New York').**
- **Variables: Start with uppercase (X, Person, Child).**
- **Facts: predicate(argument1, argument2, ...).**
- **Rules: Head :- Body.**
- **Queries: ?- Question.**

➤ Semantics

- **A fact states something is true.**
- **A rule states a condition under which something is true.**
- **A query asks if something is true, or requests possible values.**

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2. ✅ Writing Facts in Prolog

📌 Syntax:

predicate(argument1, argument2, ...).

✅ Example:

parent(john, mary).

male(john).

female(mary).

This says:

- **John is a parent of Mary.**
- **John is male.**
- **Mary is female.**

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3. ✅ Writing Rules in Prolog

📌 **Syntax:**

conclusion :- condition1, condition2, ..., conditionN.

✅ **Example:**

father(X, Y) :- parent(X, Y), male(X).

This says:

- **X is the father of Y if X is a parent of Y and X is male.**

Another example:

grandparent(X, Y) :- parent(X, Z), parent(Z, Y).

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4. ❓ Writing Queries in Prolog

📌 **Syntax:**

?- query.

✅ **Example:**

?- father(john, mary).

Output:

true.

Another example with a variable:

?- parent(john, X).

Prolog will respond with:

X = mary ;

X = paul.

This means John is the parent of Mary and Paul.

🧠 **Summary Table**

Element	Syntax Example	Meaning
Fact	male(john).	John is male
Rule	father(X, Y) :- parent(X, Y), male(X).	X is father of Y if X is parent and male
Query	?- father(john, mary).	Is John Mary's father?

If you'd like practice problems or help creating your own Prolog knowledge base, feel free to ask!