23/9/23

AI - Assignment - 3

Title: Study of Prolog Programming Language.

Aim: Demonstrate Reasoning / Interfacing using Prolog

Theory:

Prolog

- Prolog is a high level programming language used for symbolic reasoning and artificial intelligence.

→ Stands for "Programming in logic". It is often used for tasks involving symbolic manipulation rule based systems, and knowledge representation.

Symbolic language :

- It is a type of language that uses symbols often abstract representations, to convey meaning.

These symbols can represent various concepts, objects or ideas. They are distinct from natural language like English, which use words and grammar to convey meaning.

Rules, Fact and Queries

Facts: They are simple statements that declare something to be true. In Prolog, facts are typically used to represent basic knowledge

or information about the domain of interest.

(★) Rules: They are logical statements that specify relationships or conditions. They are used to derive new information based on existing facts and rules.

(★) Queries: They are questions or requests for information that you ask the prolog system to answer. Queries are prolog system to answer. They are used to find out if a particular or statement or condition is true, based on available facts and rules.

FAQ (★)

1. (★) Why Prolog?

→ To provide programming language and environment for thinking and logic to reach informed judgment, based on available knowledge.

→ Reasoning can take various forms, including deductive, inductive, ~~etc~~ abductive and analogical reasoning.

2. (★) Explain some inference techniques in propositional logic and predicate logic.

→ PROPOSITIONAL LOGIC

A. Modus Ponens (MP): If you have a conditional statement and its antecedent is true

you can infer the consequent.

$p \rightarrow q$; p is true so q must be True

B. Modus Tollens (mt) : If you have a conditional statement and its consequent is false, you can infer the negation of the antecedent

$p \rightarrow q$; $\neg q$ is true so $\neg p$ is true

→ PREDICATE Logic

A. Universal Instantiation : (UI), if you have a universally quantified statement, you can replace the variable with a specific term.

→ $\forall x P(x)$; you can infer 'P(a)' for some specific term 'a'.

B. Universal Generalization (UG) : If you have a statement that is true, you can infer a universally quantified statement.

From 'P(a)', you can infer $\forall x P(x)$.

3. (A) What are some applications of prolog

(A) Artificial Intelligence : Prolog is widely used in AI research and applications, including expert systems, Knowledge based systems and natural language processing. It is used to represent

and manipulate knowledge and rules, making it valuable for AI tasks like automated reasoning and decision making.

C. Expert systems: They are computer programs that mimic the decision making ability of human experts in specific domains.

D. Natural language processing: Prolog is used in NLP applications for parsing and processing natural language, building chatbots, and performing language understanding tasks.

E. Robotics: Prolog can be used in ~~ed~~ educational reasoning to teach logical reasoning, problem solving and programming concepts. It can be used to model and control robots. Especially in applications that involves logical decision making and planning.

(8) Conclusion: Thus we learnt about Prolog language and demonstrated reasoning and inference using Prolog.