vikash sir

unit - 4

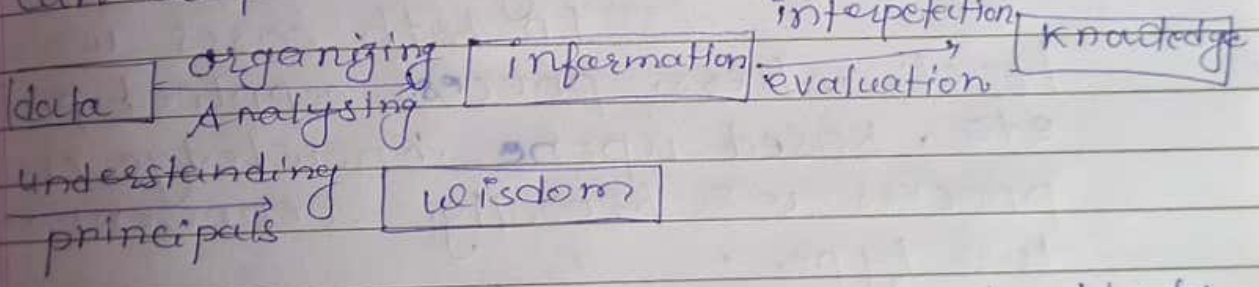
PAGE NO.:
DATE: 11/4/24

Knowledge Representation

Introduction to Knowledge

Knowledge is a general term that always start with the data / fact organise and analysis data to generate information. The interpetation or evaluation of information is refered as Knowledge.

Knowledge helps to inhance the intelligence and concern with the wisdom. The progeration of Knowledge can represent like



↳ wisdom is the basic concept that always uncover and understanding the principals of relationships that always describe pattern. Basically wisdom concern with the why

Knowledge describe about what to do and how to represent the Knowledge

Knowledge type

Knowledge is categorise into two forms

1. Tacit / implicit / informal
2. Explicit / formal

This two type knowledge have their own characteristics & behaviours where implicit or formal comes from exprience action, or within the human body

Incase of explicit knowledge its always comes from concept proces. rule and regulation it exist outside the humain beings.

In both cases we utilise 1fact, where process applied procedure etc, based upone knowledge creation process we broadly represent into two type.

1) Declarative knowledge
2) procedural knowledge

PAGE NO.:
DATE: 12/4/25

Issus in predecate logic knowledge representation

The basic goal of knowledge represent is a conclude the statement from knowledge. The issue that arise why using knowledge represent technique are many. In that case, we have to consider specifically.

① important attributes: Any attribute of object must be inform of "instance" and "Is a". These are important because support inheritance property.

② Relationship among attribute. whenever we use to describe object, the relationship b/w the attribute and object must be specific and hold the properties to represent any knowledge.

③ choosing granularity: whenever knowledge representation need to be describe, it must consider that as what level should the knowledge represent and what are the basic terms. It may be small number, large number, high level facts and

low level facts.

(4) Set of objects : It determines certain property of object that are true as a member of set of object.

(5) Finding right structure : It is about access to right structure for describing any choice like

(a) How to perform and initial selection.
(b) How to fill and appropriate details
(c) How to find structure etc.

Knowledge representation system requirement (properties)

A good knowledge represention is able fast and accurate access to knowledge and understanding of the content. So, it should have specific properties like

(1) Representancy and Adequacy

The ability to represent all kind of knowledge that are needed.

(2) Inferential adequacy : The ability to manipulate the additional to derive new structure crasponding to new knowledge from old.

(3) Inferential efferency :

The ability to incarporate additional infⁿ into the knowledge structure that can be used to faces the most promesing diraction

(4) Adquisitional efficieney : The ability to acuire to new knowledge using automatic method whenever possible ratherthan envaluent of human

Logic

Logic is a terrr that conced with the truth the statement about the ____ : Generally each statement is either true or false and logic includes.

(a) Syntax : specifies the symbols in the language about how they can be combine to fole sentence.

(2) **Semantics** : it specifies how to assign a truth value to sentence base all its meaning of word it means, what fact a sentance refers to.

(3) **Inference procedures** : It specifies methods for computing new sentences from an existing sentences.

All the above parts of the logic applied in representation of any sentence and generate knowledge.

Basically, logic is a language for reasoning, a collection of rules that helps to express the knowledge.

Logic has two types.

(1) propositional logic, that specifies the study of the statement and their connectivity

(b) predecate logic, it is a studies individuals and their properties

PAGE NO.:
DATE: / /

Rules to build a logic based representation.

(1) User defines a set of "symbols" and the associate "semantic".

(2) Logic defines ways of putting symbols together so that user can define legal "sentence" to represent true facts.

(3) Logic defines to generate "new sentences" from existing word.

(4) Sentences either true or false but not both proposition.

(5) A declaritive sentence express a "statement" with a proposition as content

Ex: The declaritive sentence the snow is white express that snow is white, that express it is true

PAGE NO.:
DATE: 17/4/25

Types of logic :

Broadly logic has further classified in two formation a data propositional logic and predicate logic.

(1) Proportional logic

It is a statement that represents the declarative sentence and specifies allows true and false logic In the representation specified about.

① propositions are sentences, either true or false but not both.

② If propositionaly true then the truth value is true.

③ In proposition false, then the truth value is false.

Propositional logic describe the way of joining or modifing entier proposition, statement or sentences. It means, it allows declear the sen that represents the a suitable sence of statement.

We use statement, variable symbol which are related and -

PAGE NO.:
DATE: / /

Simple statement either true or false, basic proposition represent the symbols inform of P, Q, R

operators, or connective are used that always represent the statement. The representation are like-

Connectives	symbols				Read as	
(1) Assertion	P					P is true
(2) Negation	~P	~	!		Not	P is false
(3) Conjuction	P∧q	·	&&	&	AND	Both p and q are true
(4) Disjunction	P∨q	||	|		OR	either p is true or q is true or both
(5) Implication	P→q	P	⇒	⇒	if & only if	is P is true then q is true, means
(6) Equivalence	P↔q ↔	≡		P↔q	P↔q if & only if	if and only if P and q are both true or both false

During representation, we use truth value by the help of truth table to represent all the connectives

p	q	¬p	¬q	p∧q	p∨q	p→q	p↔q
T	T	F	F	T	T	T	T
T	F	F	T	F	T	F	F
f	T	T	F	F	T	F	F
f	f	T	T	F	F	T	T

Predicate logic: propositional Logic is not that powerful for all types of assertions so to handle and satisfies the language, predicate logic is useful.

It is powerful for expression and reasoning as well as build upon the idea of the propositional logic.

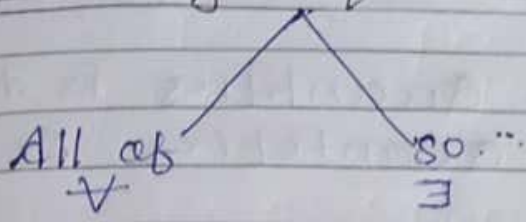
It has two component
1. subject
2. predicate

(1) The subject is, what the sentence is about.

The prediction is, always tells something about the subject.

PAGE NO.:
DATE: / /

predicate logic quantifiers



generally a predicate logic made up of propesition by the help of two operators and before applying we first assign the value to variable and then quantifies the variables using a quantifier.

Applying quantifiers on variables.

① variable x : there it always shows that x is the variable where the value is a assign.

② Declaration $x : a$: It always declear variable x and read as, "x is an element of set A"

③ statement : P is an element of x/P is statement about x, it can be represented like $\boxed{Q\ x : a \cdot P}$

there Q is the quantifier
x is a declaration
a is a statement
P is quantification of statement

PAGE NO.:
DATE: / /

Quantifies are two types

1. Universal Quantifies is denoted by ∀.
2. Extensial quantifies is denoted by ∃.

↳ universal quantifiers always concern with the all of / for all and follow the represention of any statement

↳ Statement like ~~tik~~ any English Sentemees that need to be totally represent and shows the logic of prediction like

(1)

All dogs like bones.
∀ (x) : dog (x) ⟶ like (x, bones)

(2) All cars have wheels
∀ (x) : cars(x) ⟶ have (x, wheels)

Q. Every thing is valuable
∀ (x) : valuable (x)

PAGE NO.:

DATE: / /

PAGE NO.: 24/4/25
DATE: / /

Resolution: Resolution is a procedure used in proving that arguments which are expressible in predicate logic are correct.

Resolution is a procedure that produce proofs by contraduction.

Resolution lead to generate a theorem praving technique for sentence in propositional logic and predicate logic.

Resolution is a rule of inference that theorem prover in computing form. It alway concern with the proper specification about correct / incorrect logic of any sentence.

Logic programming: It is a collection of logic statement that always specifies logical relation b/w entities.

Logical programming perform computation that determines whether are not, a particular conculation follows logical statements.

PAGE NO.:
DATE: / /

There are varities of characteristics like -

(1) The program consist of a set of statements.

(2) The rules of inferance determines that the given statements provides truth value or not.

(3) The execution of a logic program always helps in the construction of a goal statement.

(4) The programmer specifies basic logic relationship, but does not specifies the manner in which inferance rules are ~~apply~~ applied

Any programming language are consist of three basic element

(1) The syntax
(2) The symentic of program
(3) The computational model

Any programming language organized computations in procedural form or declaritive form.

In declaritive form prolog is a programming language and most populer logic programming system that also concern

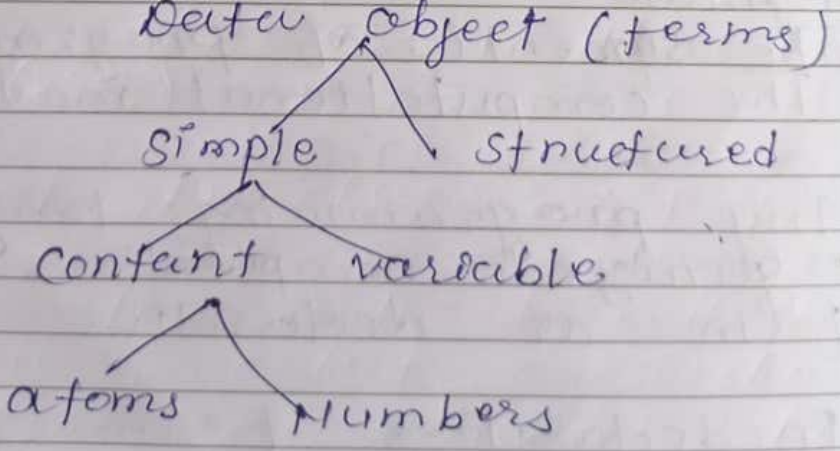
with the syntax symentics and their own computational model.

In context of prolog program syntax is an important term that always guise to write a program using statement, expression etc.

Futher, the component of syntax are divided into two parts.

1. Data components
2. Program components

Data components :



Data components are collection of data object which are represented above.

Data objects of any kind is called terms.

It also divided further in term of simple and structured datee object.

simple data objects includes atoms, numbers and variables.

Atoms a lower case letter that is followed by other letters and undersore (_), like - a, This_is

It also may be string of special character as well as string of any character inclosed within single cot like <7,::, ABC, 1234

Numbers that means numerical values that will be either integer or real numbers.
Ex: 0, 2, -16, 33, 0.5, -33.73, 6.2 etc.

Variables always within by a capital letter followed by other

letters, digits, or — like - 125, List, List - value.

Structured data object: It has further divided into general structure and special structure

General structure is a structure term that is formed by functor a list of argument.

Functor is an item.

List of arguments appears b/w paranthesis { }, seperated by a, and is argument is term.

The number of arguments of a structured term is called its arity. ex: greater than (9.6). plus (235)

special structure: — special structure always concern with the ordered collection of term, called a list, always offers a convient to represent like - empty list [] can be represent by [ ]

Non empty list carries multiple element b/w square [] separating elements by ex- ['apple, orange, grapes]
[sony, samsung, apple]

Program component: A program component always concern with the prolog program which is the collection of predicate or rules, that establises the relationships b/w objects. The components are -

(a) Cluse
(b) predicate
(c) sentence
(d) subject

(1) Cluse: cluse is a term of program component that is callection of grameticaly related works and building blocks of sentences.

Every sentence contains one or more cluses that represent any statement as well as form a proper sentance.

That sentance includes two basic terminology that is known as

subject and predicate.

Subject is what the sentence is the about.

predicate tells something about the subject.

Ex: cow eats grass.

From the above sentence, we get the idea that cow is the subject and predicate is eat grass

It complet concern with the clue

(2) predicate: predicate is nothing but combination of one or more clues with the two side.

(i) <Left hand side> :- <Right hand side>

In this format, LHS of the single goal RHS is composed of one or more goals, seperated by, called sub goals of the goal on LHS

grand-parent(x,y) :- parent(x,z)

(3) Sentence: Sentence is a part of any statement that need to be interpret and represent

the knowledge either in propositional logic or predicate logic.

Subject: It is a part of any sentence that always maintains the way of representation through which any object can work appropriately. Basicaly subject always plays a cursial role in the representation of the sentance as well as logic representation.

Semantic Networks: It is a kind of approach to represent the knowledge and maintains the statement with the different approach. According to its name it always creates multiple links because of the network and establishe of the proper relationship in the knowledge representation.

Basically semantic networks are an alternative of predicate logic in knowledge representation where we can store the knowledge in form of graph with node representing objects and arcs representing relation -ship blw thdugh objects.

PAGE NO.:
DATE: / /

Tommy is a dog

↳ dog (Tommy)

All dogs Live bones

$\forall (x) : dog(x) \rightarrow Lives(bone)$

Generally semantic network helps to abstract the concept of the statement, their meaning and a from in which they are connected to other.

This connection establishes a Knowledge by use different nodes / object and varities of relationships.

So we can say that semantic network always use to establish a proper relationship among object by the utilization of nodes as well as specific information in form of knowledge.

In the conclusion according to the above network. it always used as an alternative to predicate logic, fast to represent knowledge rather than the predicate logic in form of graph with suitable approach.

PAGE NO.:
DATE 26/4/25

Frame system in knowledge Representation

Frame system is mainly concern with the represention of knowledge that permit as to use the concept of Inheritence. Frame system always concern with collection of attributes and associated values that discribe some entity in the world.

Frames are general record like structure which consist of collection of slots and slots values, that may be any size or any type.

Slots have names and values or sub-fields called facets. Facets may also have name or any number of values.

A frame may have any numbe of slots, a slots may have any number of facets each with any number of values.

Basically, a slots contain information, attribute, condition or other related frames, that represents to full-fill the purpose

Each frame should start with open parenthesis and closed with closed parenthesis.

syntax of frame

(<frame name)
(<slot 1>(facet 1 (val 1, val 2 --- val n)
:
:
<slot 2> (facet 2 (val 1, val 2 --- val n)

Q Create a freme of the person who is Ram to a doctor. He is of 40 His wife name is sita. They name two children Babu & gita. They live in the city of Ramchi in the Jharkhand. The pincode is 835400

(Ram
(profession (value doctor))
(Age (value 40))
(wife (value sita))
(children (value Babu, Gita))
(Address
(locality (value, 2nd street))
(City (value Ramchi))
(State (value Jharkhond))
(pincode (value 835400)))))

PAGE NO.:
DATE: / /

Q Create a frame the person anand who is a hindi professor in xyz college. His wife is sangita having two children rupa and shilpa.

(Anand
(profession (value hindi professor))
(

(Anand
(profession (value hindi professor))
(college (value xyz))
(wife (value sangita))
(children (value Rupa, shilpa)))

Q Create a frame of the person akash who has a white maruti car of LX800 model. It has four doors. Its weight is 285 kg, capacity is 6 and mileage is 15 km/m

(Akash
(~~Akash~~ car
(canopy (value - maruti))
(colour (value - white))
(model (value - LX800))
(doors (value - 4))
(weight (value 285kg))
(capacity (value 6))
(mileage (value 15km/lit)))))

Semantic network