Unit 2 (AI)

Agents:

Percept ———→ Current + History

Agent Program

Agent : Percept → Decision → Action

Goals:

P → Performance   ↑   Performance
E → Environment   Rational Action
A → Actions   Optimize result
S → Sensors

Limited intelligence   <u>Simple Reflex</u>
→ Current Perception
→ No history
→ If-then rule
→ Fully observable environment
eg! AC

<u>Goal Based</u> (Theoretical)
→ Searching & planning
→ Supervised Learning
→ Choose from multiple option
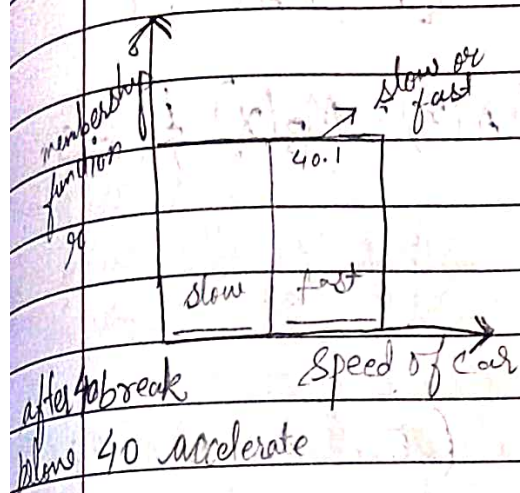eg! Path finding

(Agents)

<u>Model Based</u>
→ Partially Observable
→ Store History
eg! Self Driven Car

<u>Utility Based</u>
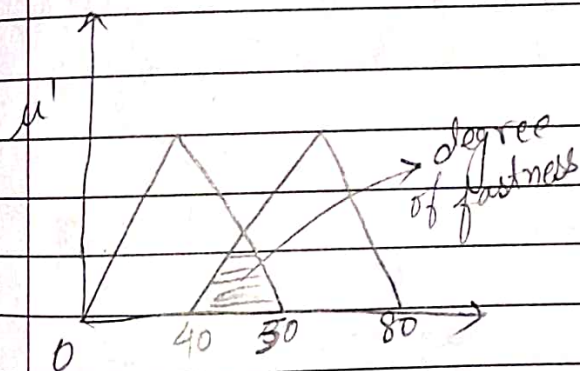→ focus on utility not goal
→ Happy & unhappy state
eg! GPS

Fuzzy Logic

Represent uncertainity with degree $[0,1]$ belongingness of a member

after 40 break
below 40 accelerate

Boolean $\rightarrow \{ (1,1)\ (2,1)\ \ldots \}$
fuzzy $\rightarrow \{ (1,\cdot8)\ (2,\cdot7)\ \ldots \}$

0 if speed $\leq$ 40
1 if speed $\geq$ 50

Operations

$U = \{ 5, 10, 20, 25, 30, 40 \}$
$A = \{ (10,\cdot2)\ (20,\cdot4)\ (25,\cdot7)\ (30,\cdot9)\ (40,1) \}$

$B = \{ (10,\cdot4)\ (20,\cdot1)\ (25,\cdot9)\ (30,\cdot2)\ (40,\cdot6) \}$

$$\text{UNION} = \max\{M_A(x), M_B(x)\} \quad x \in U$$

$$\text{INTERSECT} = \min\{M_A(x), M_B(x)\}$$

$$\text{COMPLIMENT} = M_A-(x) = [1 - M_A(x)]$$

$$\text{EQUALITY} = A=B \text{ if } M_A(x) = M_B(x) \text{ } \forall x \in S$$

$$\text{Union} = \{(10, .4)\ (20, .4)\ (25, .9)\ (30, .9)\ (40, 1)\}$$

$$\text{Intersect} = \{(10, .2)\ (20, .1)\ (25, .9)\ (30, .2)\ (40, .6)\}$$

$$\text{Compliment}_A = \{(10, .8)\ (20, .6)\ (25, .3)\ (30, .1)\ (40, 0)\}$$

$$\text{Compliment}_B = \{(10, .6)\ (20, .9)\ (25, .1)\ (30, .8)\ (40, .4)\}$$

AI

Knowledge ~~representation~~ and reasoning

Knowledge → Reason → Intelligent
↓

Syntax (representation)

Semantic (meaning)

representation

① Logic ⟨ Propositional Logic (T/F)

Predicate (quantifiers) ⟨ There exist
for all

② Rules

③ Semantic net
related objects @ eg: cow,
tiger

④ Frames (Slots and filter)
template   objects   attributes
for DB

⑤ Script

Proposition Logic
(T/F)

represent knowledge in the form of statements & deduce it as reason / argument.

eg: Sky is blue
some students are intelligent

syntax   semantic

atomic   complex
no symbols   2 or more statements

eg: $1 + 1 = 2$ (T)

¬	Negation	(Today is not friday)
∨	Disjunction	(you should eat or watch TV)
∧	Conjunction	(wash your hands & eat food)
→	if then	(if it rains then roads will be wet)
↔	iff	(I will go to mall iff I have to shop)

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

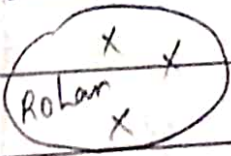You can access the internet from campus only if you are CSE student or you are not freshmen.   R

$P \rightarrow R \lor Q$

Predicate Logic

position) pro $\rightarrow$ colour of ball is red

icate) pre $\rightarrow$ color (ball, red)

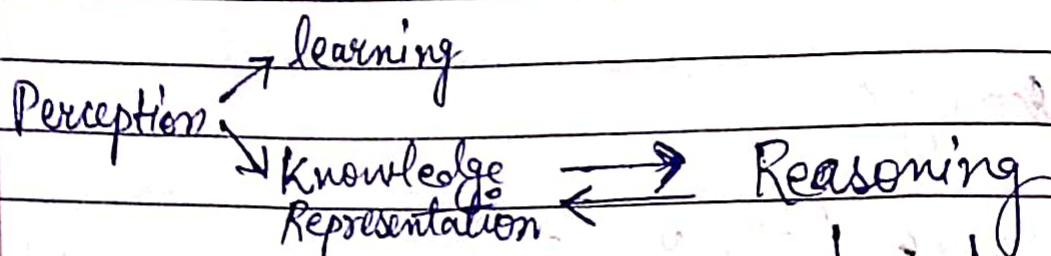predicate → arguments

eg. Rohan likes apple.

All students are intelligent Rohan is a student

Rohan is intelligent (Rohan) (inference)

Everybody loves somebody. (Represent Quantity)

Quantifiers

universal $\forall$ (for all)   existential $\exists$ (there exists)

Knowledge Cycle

Perception → learning

↓ Knowledge ⇄ Reasoning
Representation
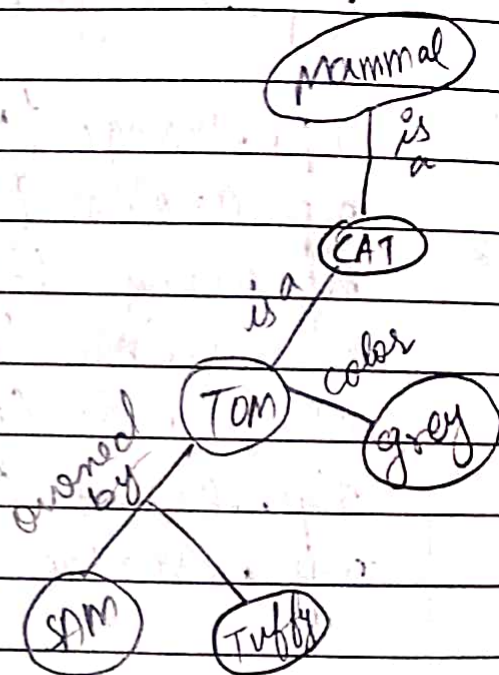
Reasoning → Planning ↓ Execution

Types of Knowledge

- Declarative
- Structural
- Procedural
- Meta
- Heuristic

Semantic Network

- Tom is a cat.
- Tom is grey in color
- Tom is mammal
- Tom is owned by sam

Mammal
is a
CAT
is a
color
TOM → grey
owned by
SAM
Tuffy

Frames (name + value)

Slots   values
or
attribute

(abc)
(profession (value student))