9/3/21 AI.

Rule Based System

→ Well formed formulae (WFFs) in propositional or predicate logic represent assertional knowledge.

→ Wffs are divided into two categories :-

  1. Rules : Assertions in implication form. $P \rightarrow Q$ [If ... then ...]
  2. Facts : Assertions that represent domain specific knowledge.

→ Declarative knowledge v/s Procedural knowledge.

(Declarative knowledge: what to do? Procedural knowledge: what to do & how to do?)

Example of Rules

If it rains today, the roads will be wet today.]

Rains (today) → Wet_Road (today)

If Rains (today) then Wet_Road (today)

If Rains (today) and not_covered (roads) then wet_road (today)

⇒ Rains (today) ∧ not_covered (roads) → wet_road (today)

Which are facts ? → perfect square (36)

Can the facts be generated ? Yes

Recall Modus Ponens

$$\frac{P \rightarrow Q \quad P}{Q} \qquad \frac{Q \rightarrow R \quad Q}{R} \qquad \frac{R \rightarrow S \quad R}{S} \quad \vdots$$

Rule Chaining

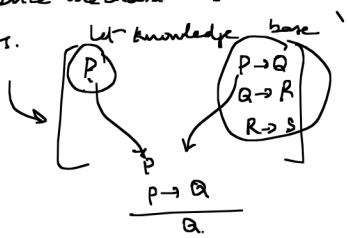
$$\frac{A \rightarrow B \quad A}{B} \qquad \frac{B \rightarrow C \quad B}{C} \qquad \frac{C \rightarrow D \quad C}{D} \ldots$$

Rules Based System

⇒ A system whose knowledge base is represented as a set of rules and facts is called a Rule based system.

⇒ A rule based system consists of :-

- A collection of If ... then .. rules.
- A collection of facts.
- Interpreter / Control mechanism / Inference mechanism :- controls the application of rules, given facts.



- Rules are represented in following form:-

IF <antecedent> THEN <consequent>

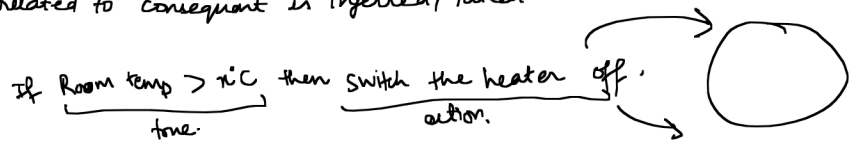
- When antecedent is NULL then Rule becomes fact....
- Rules are normally represented as Horn clauses.

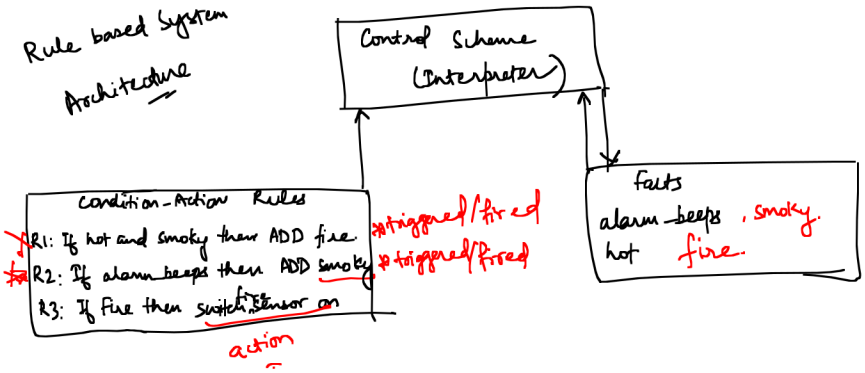
$P \rightarrow Q$	$\neg P \vee Q$	✓
$P \wedge Q \rightarrow R$	$\neg P \vee \neg Q \vee R$	✓
$P \wedge Q \rightarrow R \vee S$	$\neg P \vee \neg Q \vee R \vee S$	✗

Horn clauses can have atmost one non-negative literal.

Triggered and Fired Rules

- A rule is triggered when all antecedents evaluate to true
- A rule is fired when the action stated in consequent or inference related to consequent is inferred/taken.





Inference Machine

A machine that implements strategies to utilize the knowledge base and derive new conclusions from it.