SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME : 19PE003- Artificial Intelligence

III YEAR /V SEMESTER

Unit 1- INTRODUCTION

Topic 4 : PRODUCTION SYSTEMS

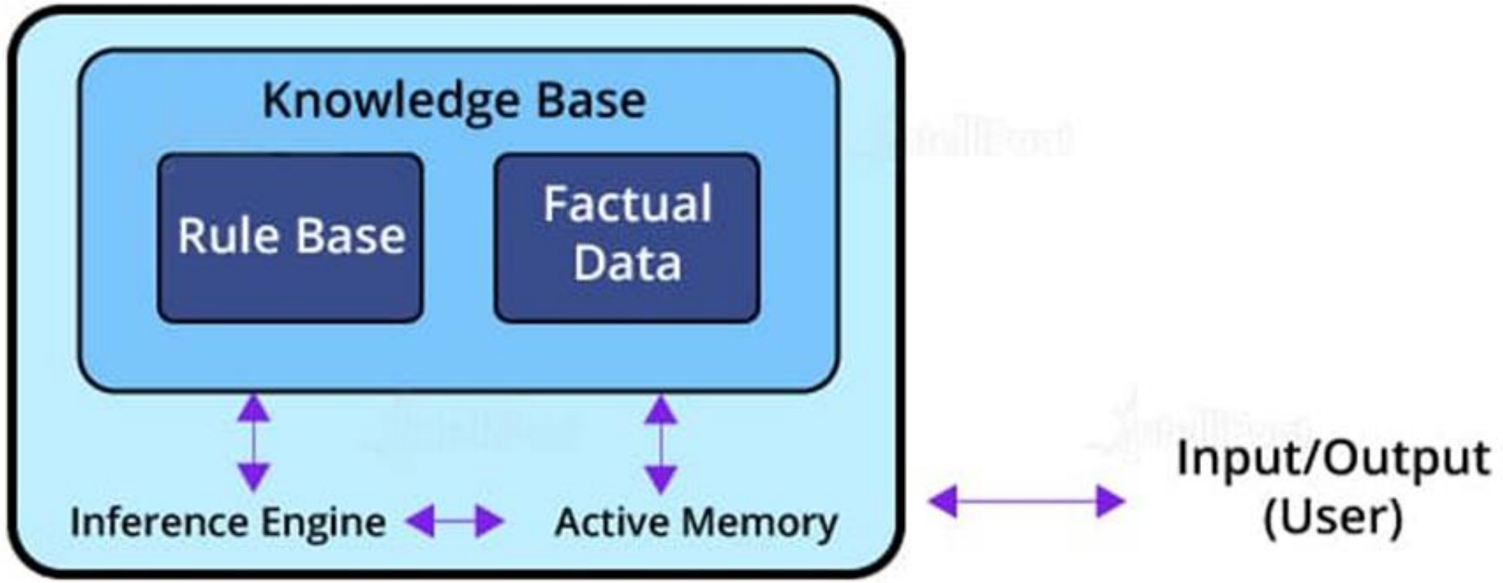
Recall previous topic

Problem Characteristics

Problem characteristic	Satisfied	Reason
Is the problem decomposable?	No	One Single solution
Can solution steps be ignored or undone?	Yes	
Is the problem universe predictable?	Yes	Problem Universe is predictable bcz to slove this problem it require only one person .we can predict what will happen in next step
Is a good solution absolute or relative?	absolute	**Absolute solution** , water jug problem may have number of solution , bt once we found one solution,no need to bother about other solution **Bcz it doesn't effect on its cost**
Is the solution a state or a path?	Path	Path to solution
What is the role of knowledge?		lot of knowledge helps to constrain the search for a solution.
Does the task require human-interaction?	Yes	additional assistance is required. Additional assistance, like to get jugs or pump

What is a Production System in AI?

- A production system is based on a set of rules about behavior. These rules are a basic representation found helpful in expert systems, automated planning, and action selection. It also provides some form of artificial intelligence.


Knowledge Base
Rule Base
Factual Data
Inference Engine
Active Memory
Input/Output (User)

In this, we will talk about the production system in artificial intelligence

in the following sequence:

- **What is Production System?**
- **Features of Production System**
- **Control/Search Strategies**
- **Production System Rules**
- **Classes of Production System**
- **Advantages & Disadvantages**
- **Production System in AI: Example**

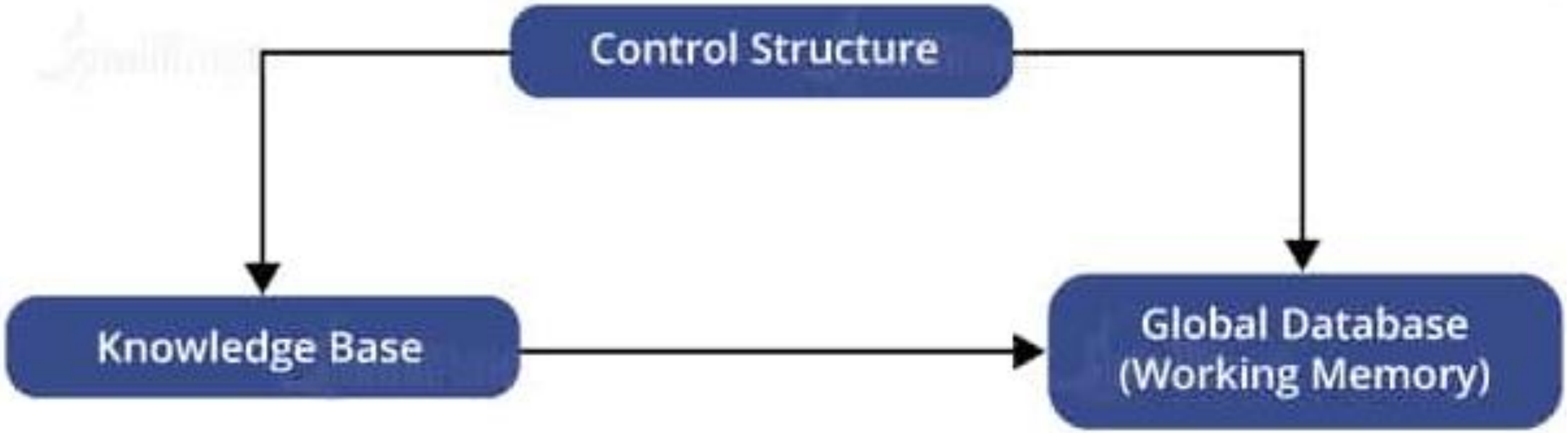
Components of Production System

The major components of Production System in Artificial Intelligence are:

- **Global Database:** The global database is the central data structure used by the production system in Artificial Intelligence.

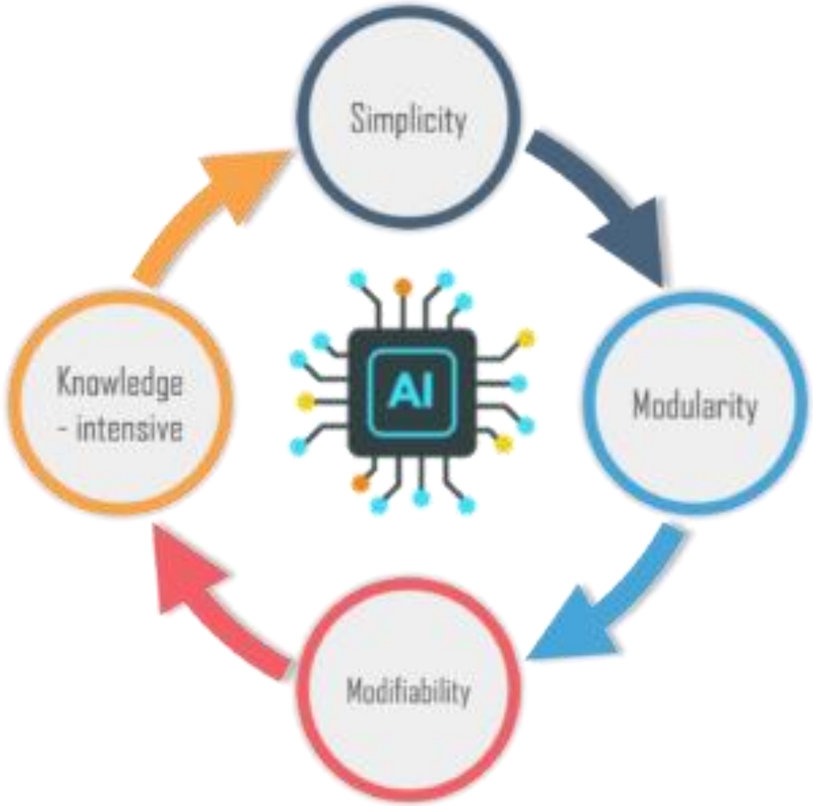
- **Set of Production Rules:** The production rules operate on the global database. Each rule usually has a precondition that is either satisfied or not by the global database. If the precondition is satisfied, the rule is usually be applied. The application of the rule changes the database.

- **A Control System:** The control system then chooses which applicable rule should be applied and ceases computation when a termination condition on the database is satisfied. If multiple rules are to fire at the same time, the control system resolves the conflicts.


Control Structure
Knowledge Base
Global Database
(Working Memory)

Features of Production System in Artificial Intelligence

The main features of the production system include:



Activity

1. Simplicity: The structure of each sentence in a production system is unique and uniform as they use the "IF-THEN" structure. This structure provides simplicity in knowledge representation. This feature of the production system improves the readability of production rules.

2. Modularity: This means the production rule code the knowledge available in discrete pieces. Information can be treated as a collection of independent facts which may be added or deleted from the system with essentially no deleterious side effects.

3. Modifiability: This means the facility for modifying rules. It allows the development of production rules in a skeletal form first and then it is accurate to suit a specific application.

4. Knowledge-intensive: The knowledge base of the production system stores pure knowledge. This part does not contain any type of control or programming information. Each production rule is normally written as an English sentence; the problem of semantics is solved by the very structure of the representation.

Control/Search Strategies

How would you decide which rule to apply while searching for a solution for any problem? There are certain requirements for a good control strategy that you need to keep in mind, such as:

- The first requirement for a good control strategy is that it should **cause motion**.
- The second requirement for a good control strategy is that it should be **systematic**.
- Finally, it must be **efficient** in order to find a good answer

Production System Rules

Production System rules can be classified as:

- **Deductive Inference Rules**
- **Abductive Inference Rules**

You can represent the knowledge in a production system as a set of rules along with a control system and database. It can be written as:

If(Condition) Then (Condition)

The production rules are also known as condition-action, antecedent-consequent, pattern-action, situation-response, feedback-result pairs.

Classes of Production System in Artificial Intelligence

There are four major classes of Production System in Artificial Intelligence:

- **Monotonic Production System**: It's a production system in which the application of a rule never prevents the later application of another rule, that could have also been applied at the time the first rule was selected.
- **Partially Commutative Production System**: It's a type of production system in which the application of a sequence of rules transforms state X into state Y, then any permutation of those rules that is allowable also transforms state x into state Y. Theorem proving falls under the monotonic partially communicative system.

•**Non-Monotonic Production Systems**: These are useful for solving ignorable problems. These systems are important from an implementation standpoint because they can be implemented without the ability to backtrack to previous states when it is discovered that an incorrect path was followed.

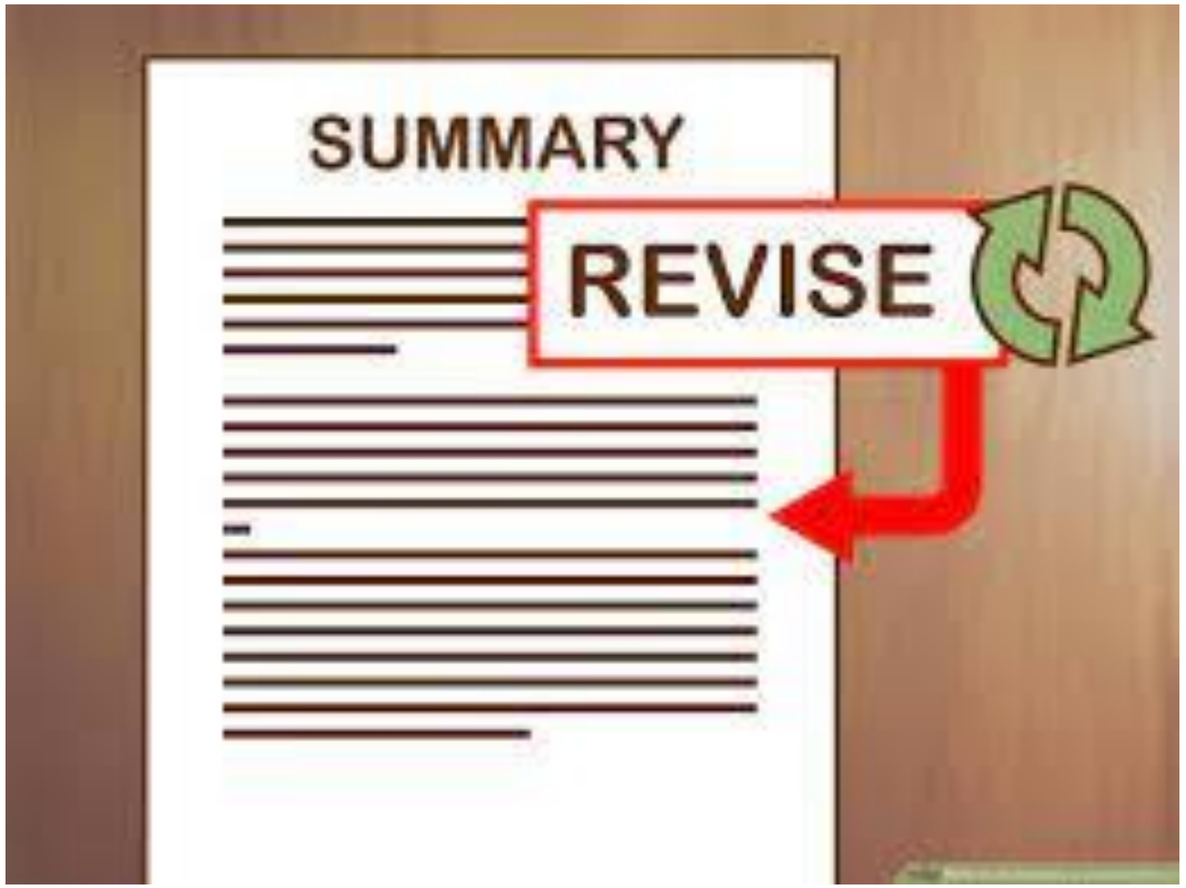
•**Commutative Systems**: These are usually useful for problems in which changes occur but can be reversed and in which the order of operation is not critical.

Advantages

- Provides excellent tools for structuring AI programs
- The system is highly modular because individual rules can be added, removed or modified independently
- Separation of knowledge and Control-Recognises Act Cycle

Disadvantages:

- It is very difficult to analyze the flow of control within a production system
- It describes the operations that can be performed in a search for a solution to the problem.
- There is an absence of learning due to a rule-based production system that does not store the result of the problem for future use.


SUMMARY
REVISE

Evaluation

- What is AI?
- Name the application related to AI
- What programming language used in AI?
- What s advantages of AI?

REFERENCES

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach||, Prentice Hall, Third Edition, 2009.

THANK YOU