RAMA UNIVERSITY
www.ramauniversity.ac.in

FACULTY OF EGINEERING

ARTIFICIAL INTELLIGENCE
LECTURE-14
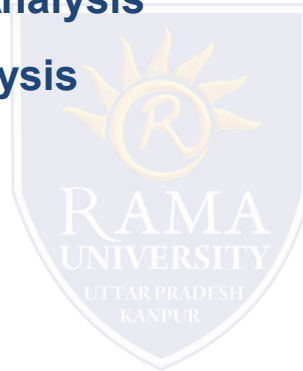
Mr. Dhirendra

Assistant Professor
Computer Science & Engineering

OUTLINE

❖**Means-Ends Analysis in Artificial Intelligence**

❖**How means-ends analysis Works**

❖**Operator Subgoaling**

❖**Algorithm for Means-Ends Analysis**

❖**Example of Mean-Ends Analysis**

❖**MCQ**

❖**References**

Means-Ends Analysis in Artificial Intelligence

•We have studied the strategies which can reason either in forward or backward, but a mixture of the two directions is appropriate for solving a complex and large problem. Such a mixed strategy, make it possible that first to solve the major part of a problem and then go back and solve the small problems arise during combining the big parts of the problem. Such a technique is called Means-Ends Analysis.

•Means-Ends Analysis is problem-solving techniques used in Artificial intelligence for limiting search in AI programs.

•It is a mixture of Backward and forward search technique.

•The MEA technique was first introduced in 1961 by Allen Newell, and Herbert A. Simon in their problem-solving computer program, which was named as General Problem Solver (GPS).

•The MEA analysis process centered on the evaluation of the difference between the current state and goal state.
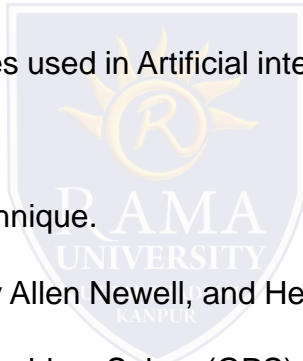
How means-ends analysis Works

The means-ends analysis process can be applied recursively for a problem. It is a strategy to control search in problem-solving. Following are the main Steps which describes the working of MEA technique for solving a problem.

❑First, evaluate the difference between Initial State and final State.

❑Select the various operators which can be applied for each difference.

❑Apply the operator at each difference, which reduces the difference between the current state and goal state.
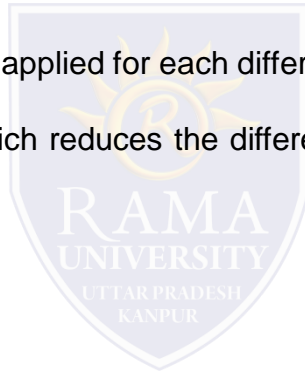
Operator Sub goaling

In the MEA process, we detect the differences between the current state and goal state. Once these differences occur, then we can apply an operator to reduce the differences. But sometimes it is possible that an operator cannot be applied to the current state. So we create the sub problem of the current state, in which operator can be applied, such type of backward chaining in which operators are selected, and then sub goals are set up to establish the preconditions of the operator is called **Operator Sub goaling.**

Algorithm for Means-Ends Analysis

Step 1: Compare CURRENT to GOAL, if there are no differences between both then return Success and Exit.

Step 2: Else, select the most significant difference and reduce it by doing the following steps until the success or failure occurs.

Select a new operator O which is applicable for the current difference, and if there is no such operator, then signal failure.

Attempt to apply operator O to CURRENT. Make a description of two states.

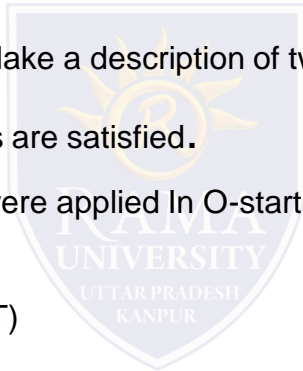i) O-Start, a state in which O?s preconditions are satisfied.

ii) O-Result, the state that would result if O were applied In O-start.

If

(First-Part <------ MEA (CURRENT, O-START)

And

(LAST-Part <----- MEA (O-Result, GOAL), are successful, then signal Success and return the result of combining FIRST-PART, O, and LAST-PART.

Example of Mean-Ends Analysis

•Let's take an example where we know the initial state and goal state as given below. In this problem, we need to

get the goal state by finding differences between the initial state and goal state and applying operators.

Initial State   Goal State
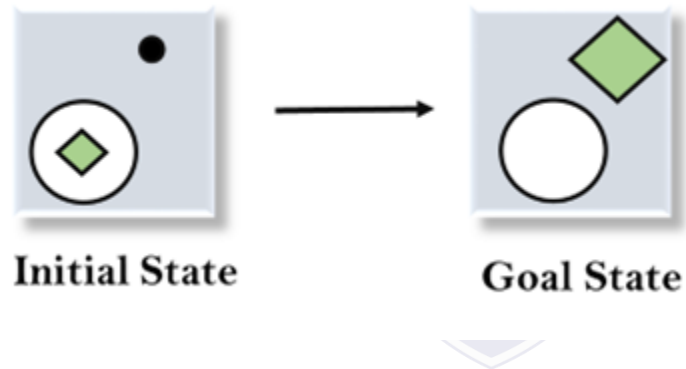
1. What is Machine learning?

a) The autonomous acquisition of knowledge through the use of computer programs

b) The autonomous acquisition of knowledge through the use of manual programs

c) The selective acquisition of knowledge through the use of computer programs

d) The selective acquisition of knowledge through the use of manual programs

2. Which of the factors affect the performance of learner system does not include?

a) Representation scheme used

b) Training scenario

c) Type of feedback

d) Good data structures

3. Different learning methods does not include?
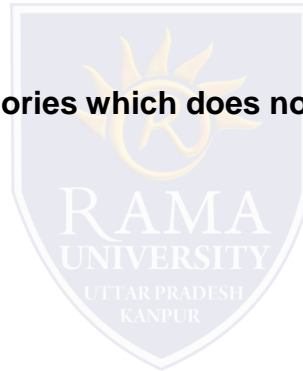
a) Memorization

b) Analogy

c) Deduction

d) Introduction

4. In language understanding, the levels of knowledge that does not include?

a) Phonological

b) Syntactic

c) Empirical

d) Logical

5. A model of language consists of the categories which does not include?

a) Language units

b) Role structure of units

c) System constraints

d) Structural units

References

- https://www.javatpoint.com/digital-image-processing-tutorial

- https://www.tutorialpoint.com/

- Stuart Russell, Peter Norvig, "Artificial Intelligence - A Modern Approach", Pearson Education.

- Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill.

- E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education.

- Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India.