SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF AI&ML

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE

II YEAR - III SEM

UNIT III – **Planning**

Planning

- Planning is about deciding the tasks to be performed by the computer programmer or robots to achieve a specific goal.
- A plan is considered a sequence of actions, and each action has its preconditions that must be satisfied before it can act and some effects that can be positive or negative.
- Executation of planning is choosing a sequence of action.
- Planning is arranging sequence of action to achieve a goal.

Classical Planning

- Planning can be Classical or Non-classical.
- In case of Classical Planning, the environment is fully observable, deterministic, static and discrete.
- Non-classical Planning, the environment is partially observable (i.e. the entire state of the environment is not visible at a given instant) or non- deterministic (or stochastic, i.e. the current state and chosen action cannot completely determine the next state of the environment).
- The agent performs three tasks in classical planning

Planning: The agent plans after knowing what is the problem.

Acting: It decides what action it has to take.

Learning: The actions taken by the agent make him learn new things.

- A language known as **PDDL(Planning Domain Definition Language)** which is used to represent all actions into one action schema.

PDLL describes the four basic things needed in a search problem:

- **Initial state:** It is the representation of each state as the conjunction format.
- **Actions:** It is defined by a set of action schemas which implicitly define the **ACTION()** and **RESULT()** functions.
- **Result:** It is obtained by the set of actions used by the agent.
- **Goal:** It is same as a precondition, which is a conjunction of literals (whose value is either positive or negative).

Two types of planning

Forward State Space Planning (FSSP)

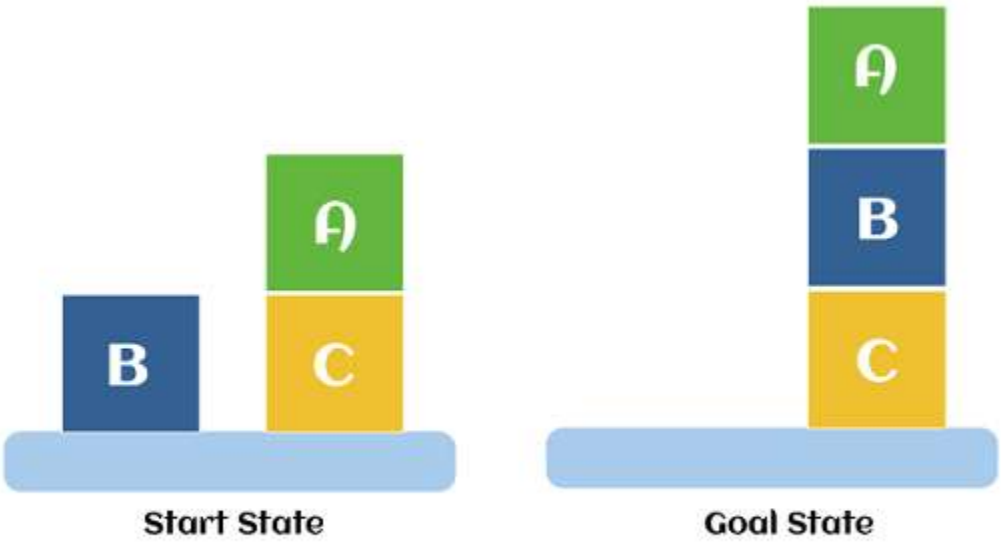
- FSSP behaves in the same way as forwarding state-space search.
- It says that given an initial state S in any domain, we perform some necessary actions and obtain a new state S' (which also contains some new terms), called a progression.
- It continues until we reach the target position.
- Action should be taken in this matter.

Backward State Space Planning (BSSP)

- BSSP behaves similarly to backward state-space search.
- In this, we move from the target state g to the sub-goal g, tracing the previous action to achieve that goal.
- This process is called regression (going back to the previous goal or sub-goal).
- These sub-goals should also be checked for consistency. The action should be relevant in this case.

Block-world planning problem

- The block-world problem is known as the Sussmann anomaly.
- When two sub-goals, G1 and G2, are given, a non-interleaved planner either produces a plan for G1 that is combined with a plan for **G2** or vice versa.
- In the block-world problem, three blocks labeled 'A', 'B', and 'C' are allowed to rest on a flat surface. The given condition is that only one block can be moved at a time to achieve the target.



Word planning problem

The start position and target position are shown in the following diagram.

Components of the planning system

The plan includes the following important steps:

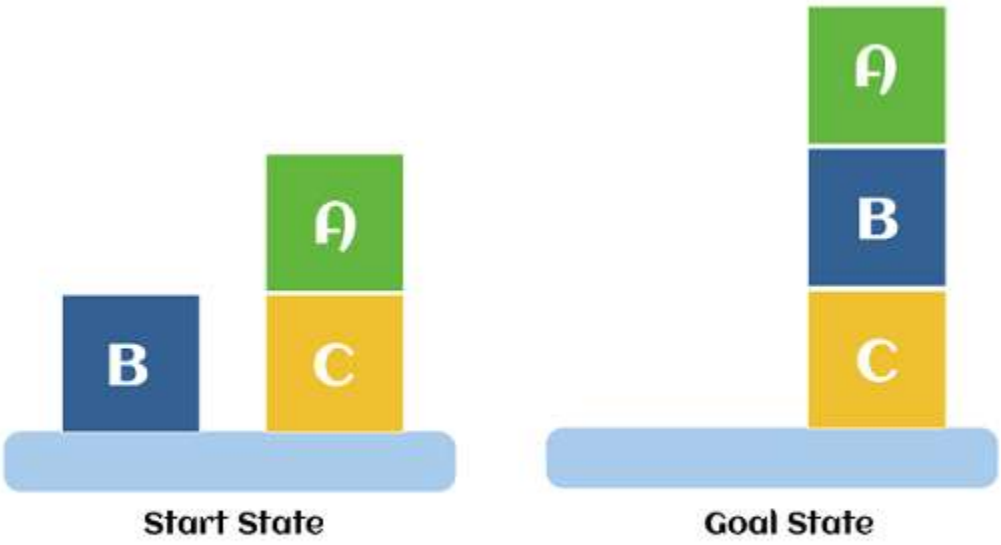
- Choose the best rule to apply the next rule based on the best available guess.
- Apply the chosen rule to calculate the new problem condition.
- Find out when a solution has been found.
- Detect dead ends so they can be discarded and direct system effort in more useful directions.
- Find out when a near-perfect solution is found.

Target stack plan

- It is one of the most important planning algorithms .
- Stacks are used in algorithms to capture the action and complete the target.
- A knowledge base is used to hold the current situation and actions.
- A target stack is similar to a node in a search tree, where branches are created with a choice of action

The important steps of the algorithm are mentioned below:

- Start by pushing the original target onto the stack. Repeat this until the pile is empty. If the stack top is a mixed target, push its unsatisfied sub-targets onto the stack.
- If the stack top is a single unsatisfied target, replace it with action and push the action precondition to the stack to satisfy the condition.
- If the stack top is an action, pop it off the stack, execute it and replace the knowledge base with the action's effect.



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