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HOME WORK

39.	What is the best method to go for the game playing problem?
a.	Optimal Search
b.	Random Search
c.	Heuristic Search
d.	Stratified Search

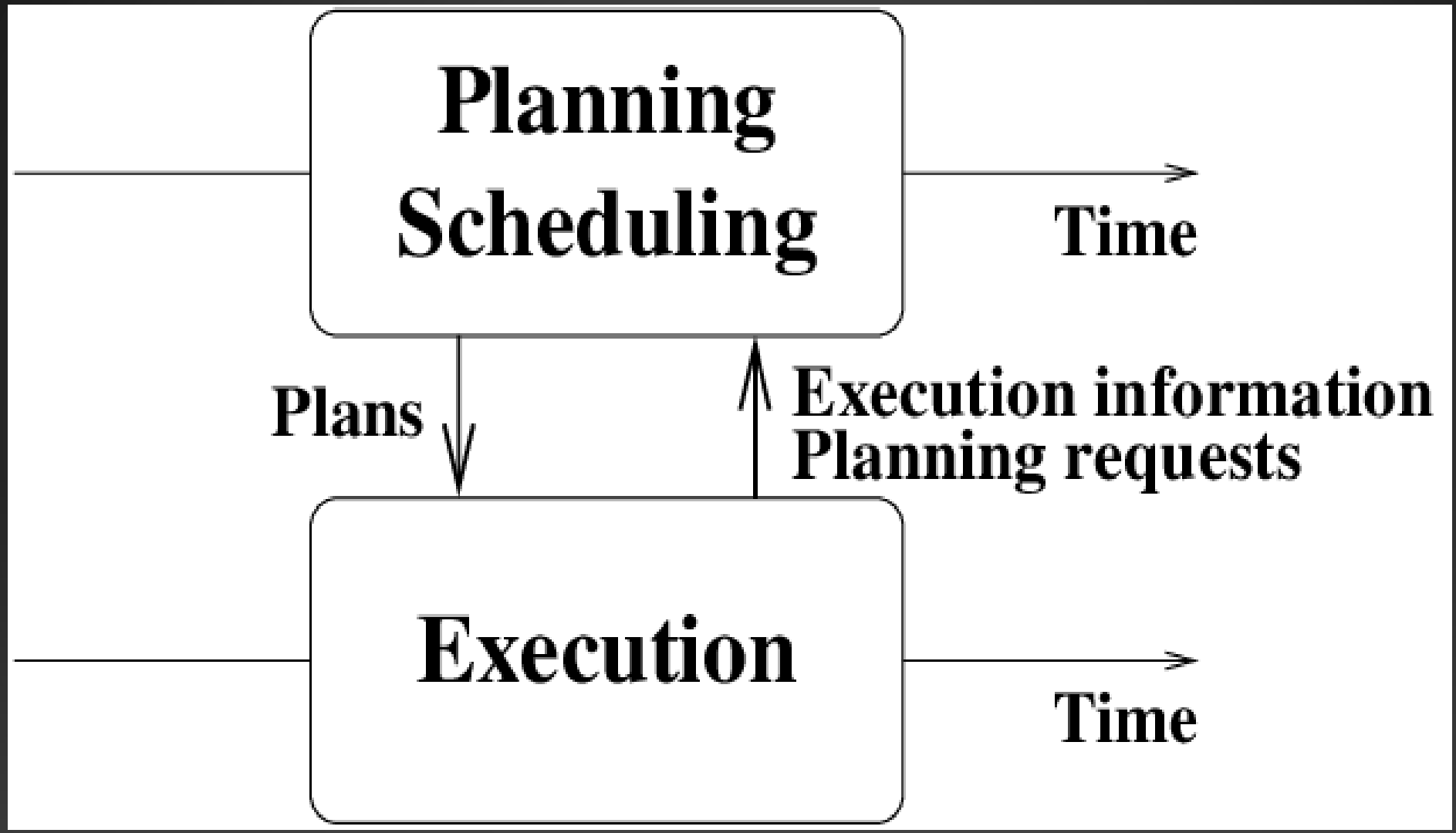
❑ Approaches to AI

Content:

1. Planning in AI

WHAT IS PLANNING IN AI?

- The planning in Artificial Intelligence is about the decision making tasks performed by the robots or computer programs to achieve a specific goal.
- The execution of planning is about choosing a sequence of actions with a high likelihood to complete the specific task.



Components of Planning System

- **Choose the best rule** to apply next based on the best available heuristic information.
- **Apply the chosen rule** to compute the new problem state that arises from its application.
- **Detect** when a solution has been found.
- **Detect dead ends** so that they can be abandoned and the system's effort directed in more fruitful directions.
- **Detect when** an almost correct solution has been found and employ special techniques to make it totally correct.

1.CHOOSING RULES TO APPLY

- In order to select appropriate rules first isolate a set of difference between the desired goal state and current state and then identify those rules that are relevant to reducing those differences.

- If several rules are found, a variety of other heuristic information can be exploited to choose among them.

2. APPLYING RULES

- In simple system, applying rule is easy. Each rule simply specified the Problem state that would result from its applications.
- In complex system, we must be able to deal with rules that specify only a small part of the complete problem state.
- One way is to describe, for each action, each of the changes it makes to the state description.

DETECT A SOLUTION

- Find a solution to a problem when is has found a sequence of operators that transforms the initial problem state into the goal state.
- One of the representatives systems for planning system is, predicate logic.

DETECT DEAD ENDS

- The exploring path that can never lead to a solution.
- No indication of goal Node.
- If the search process is reasoning forward from the initial state, it can prune any paths that leads to a state from which the goal state cannot be reached.
- If the search process is reasoning backwards from the goal state it can also terminate a path either because it is sure that the initial state cannot be reached.

REPAIRING AN ALMOST CORRECT SOLUTION:

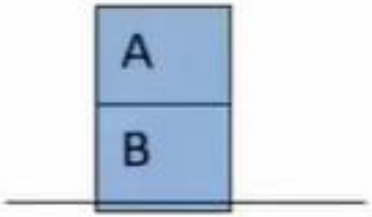
- A slightly better approach is to compared the desired solution and derived solution and if there is a difference then the problem solving system can be called again and asked to find a way of eliminating this new difference. The first solution could be combined with the second one to form a solution to the original problem.

BLOCKS-WORLD PLANNING PROBLEM

- The blocks-world problem is known as **Sussman Anomaly.**
- **There is a flat surface on which blocks can be placed.**
- **There are a number of sequare blocks, all the same size.**
- **They can be stacked one upon the other.**
- **There is robot arm that can manipulate the blocks.**

Actions of the robot arm

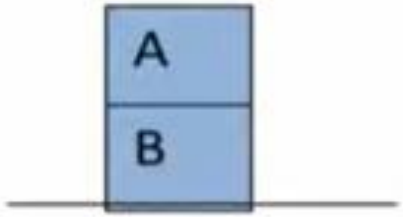
- UNSTACK(A,B)
- STACK(A,B)
- PICKUP(A)
- PUTDOWN(A)



- Notice that the robot arm can hold only one block at a time.

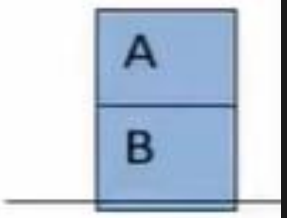
Predicate

- In order to specify both the conditions under which an operation may be performed and the results of performing it, we need the following predicates:
- ON(A,B)
- ONTABLES(B)
- CLEAR(A)
- HOLDING(A)
- ARMEMPTY



- ON(A,B) ^ ONTABLE(B)^CLEAR(A)

If we execute UNSTACK(A,B) in this state



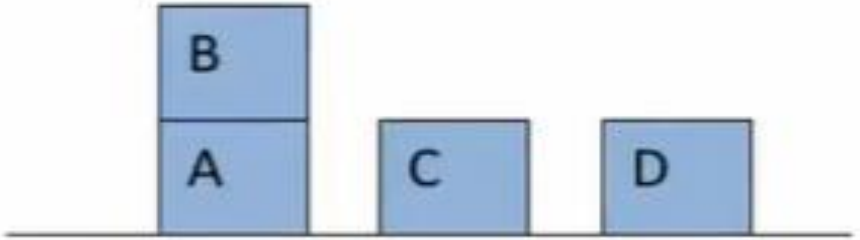
Then,

HOLDING(A)^CLEAR(B)

Goal Stack Planning

- To start with goal stack is simply:

ON(C,A)^ON(B,D)^ONTABLE(A)^ONTABLE(D)



ONTABLE(A) and ONTABLE(D) are already true in the initial state.

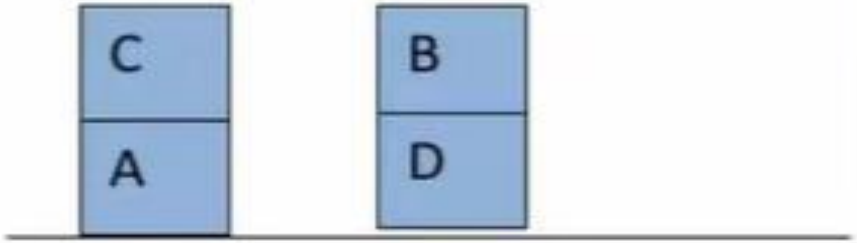
- **Alternative 1: Goal Stack:**

ON(C,A)

ON(B,D)

ON(C,A)^ON(B,D)^OTAD

- **Alternative 2: Goal stack:**



ON(B,D)

ON(C,A)

ON(C,A)^ON(B,D)^OTAD

Goal Stack Planning

- Next we see if CLEAR(A) is true. It is not. The only operator that could make it true is UNSTACK(B,A). This produces the goal stack:

ON(B,A)

CLEAR(B)

ON(B,A)^CLEAR(B)^ARMEMPTY

UNSTACK(B,A)

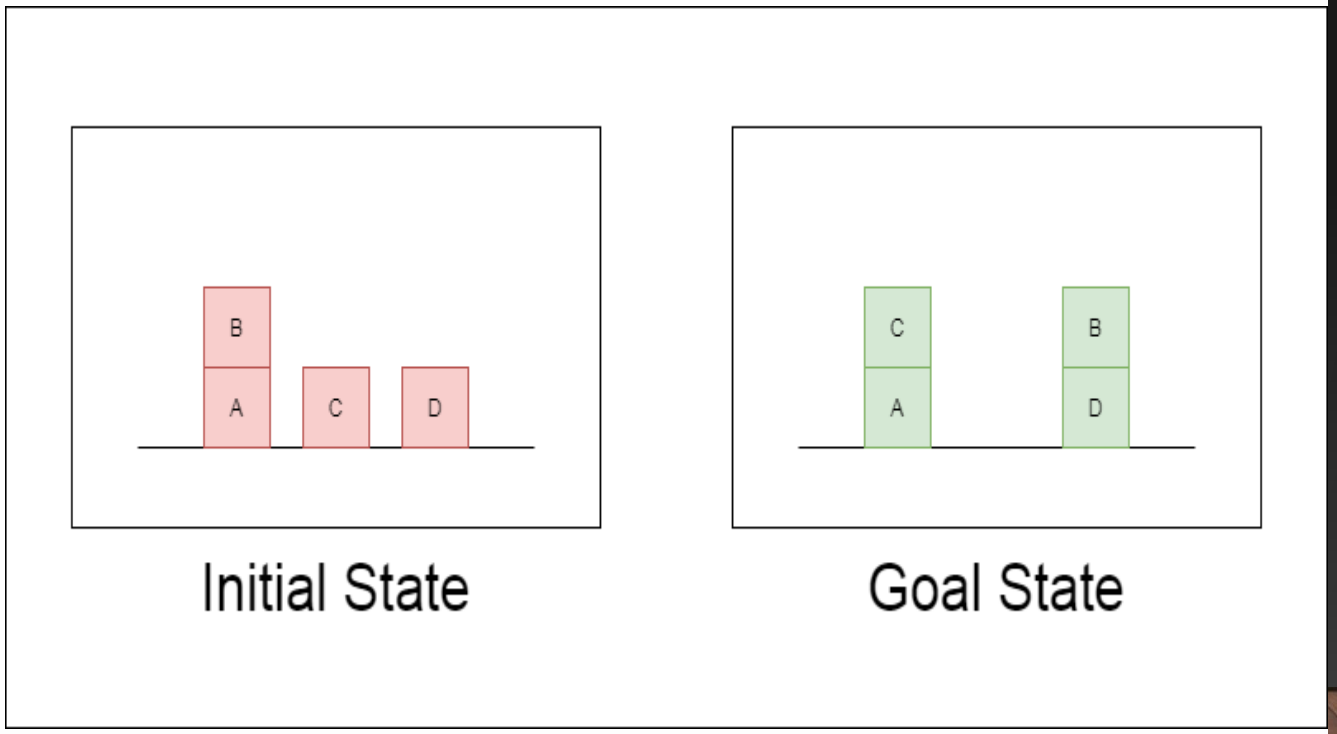
HOLDING(C)

CLEAR(A)^HOLDING(C)

STACK(C,A)

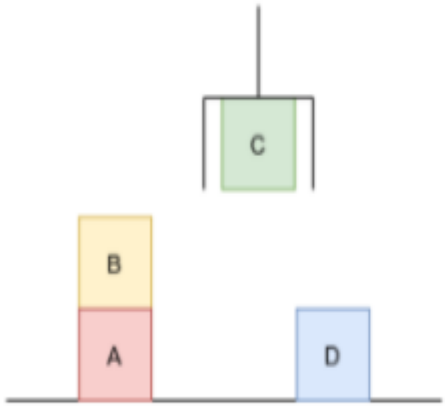
ON(B,D)

ON(C,A)^ON(B,D)^OTAD



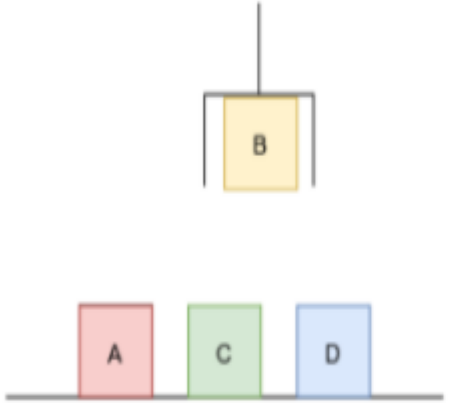
Initial State

Goal State

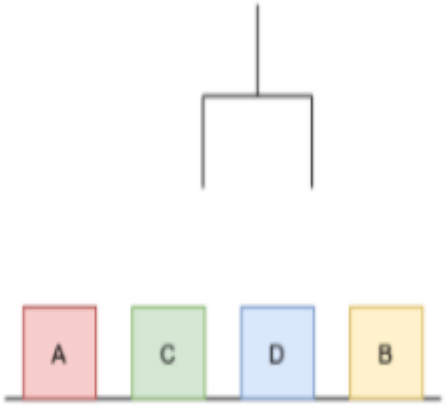


1 - PICKUP(C)

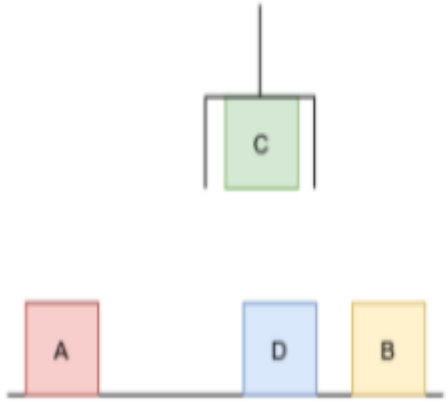
2 - PUTDOWN(C)



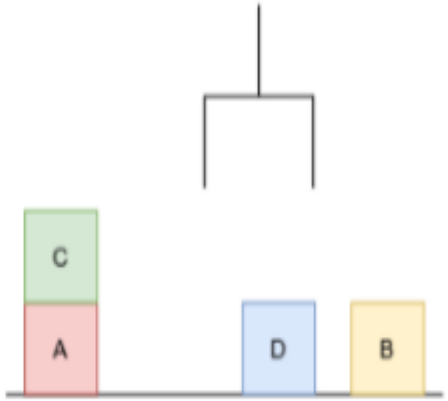
3 - UNSTACK(B,A)



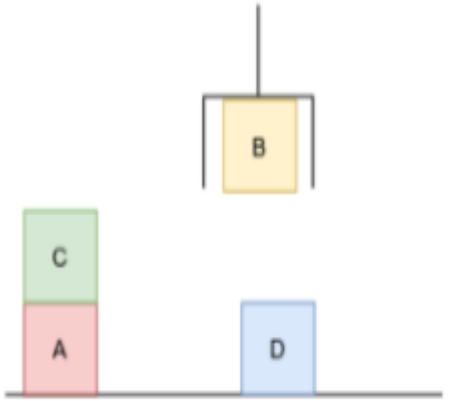
PUTDOWN(B)



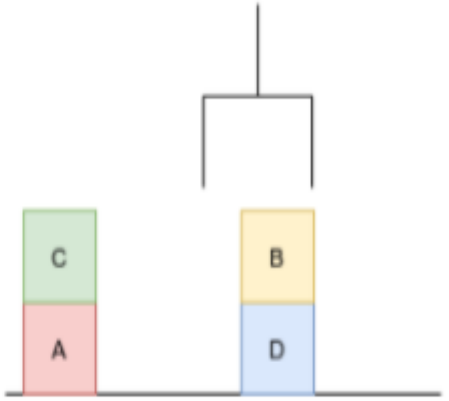
5 - PICKUP(C)



6 - STACK(C,A)



7 - PICKUP(B)



8 - STACK(B,D)

Goal Stack Planning

ALT1:	ALT2:
ONTABLE(C)	ON(C,x)
CLEAR(C)	CLEAR(C)
ARMEMPTY	ARMEMPTY
ONTABLE(C) ^CLEAR(C)^AR MEMPTY	ON(C,x)^CLEA R(C)^ARMEMP TY
PICKUP(C)	UNSTACK(C,x)
CLEAR(A)^HOL DING(C)	CLEAR(A)^HOL DING(C)
STACK(C,A)	STACK(C,A)
ON(B,D)	ON(B,D)
ON(C,A)^ON(B,D)^OTAD	ON(C,A)^ON(B, D)^OTAD

HOME WORK

2.	An expert system shell is an expert system without
a.	domain knowledge
b.	explanation facility
c.	reasoning with knowledge
d.	all of the above


FEEDBACK

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