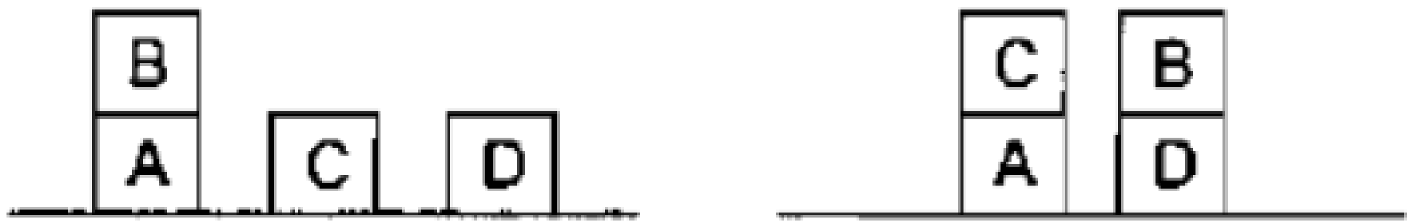
STRIPS(GOAL STACK PLANNING)

The **Stanford Research Institute Problem Solver**, known by its acronym STRIPS, is an automated planner developed by Richard Fikes and Nils Nilsson in 1971 at SRI International.



start: $ON(B, A) \wedge$
$ONTABLE(A) \wedge$
$ONTABLE(C) \wedge$
$ONTABLE(D) \wedge$
$ARMEMPTY$

goal: $ON(C, A) \wedge$
$ON(B, D) \wedge$
$ONTABLE(A) \wedge$
$ONTABLE(D)$

When we begin solving this problem, the goal stack is simply

$$ON(C, A) \wedge ON(B, D) \wedge ONTABLE(A) \wedge ONTABLE(D)$$

But we want to separate this problem into four subproblems, one for each component of the original goal. Two of the subproblems, ONTABLE(A) and ONTABLE(D), are already true in the initial state. So we will work on only the remaining two.

ON(C, A)	ON(B, D)
ON(B, D)	ON(C, A)
ON(C, A) $\wedge$ ON(B, D) $\wedge$ OTAD	ON(C, A) $\wedge$ ON(B,D) $\wedge$ OTAD
[1]	[2]

We choose the first alternative.

Exploring alternative 1 check whether ON(C,A) is true in the current state.

So we place STACK (C,A) in place of ON(C,A)

STACK(C, A)
ON(B, D)
ON(C, A) $\wedge$ ON(B, D) $\wedge$ OTAD

STACK(C, A) replaced ON(C, A) because after performing the STACK we are guaranteed that ON(C, A) will hold. But in order to apply STACK(C, A), its preconditions must hold, so we must establish them as subgoals. Again we must separate a compound goal

CLEAR(A) $\wedge$ HOLDING(C)

This produces new goal stack

CLEAR(A)
HOLDING(C)
CLEAR(A) $\wedge$ HOLDING(C)
STACK(C, A)
ON(B, D)
ON(C, A) $\wedge$ ON(B, D) $\wedge$ OTAD

Next we check CLEAR(A) is True. Its not the only operator make it true is UNSTACK(B,A)

So we attempt to apply it .

This produces new goal stack

ON(B, A)
CLEAR(B)
ARMEMPTY
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

This time, when we compare the top element of the goal stack, ON(B, A), to the world model, we see that it is satisfied. So we pop it off and consider the next goal, CLEAR(B). It, too, is already true in the world model, although it was not stated explicitly as one of the initial predicates. But from the initial predicates and the blocks world axiom that says that any block with no blocks on it is clear, a theorem prover could derive CLEAR(B). So that goal, too, can be popped from the stack. The third precondition for UNSTACK(B, A) remains. It is ARMEMPTY, and it is also true in the current world model, so it can be popped off the stack.

The goal stack now is

HOLDING(C)
CLEAR(A) ∧ HOLDING(C)
STACK(C, A)
ON(B, D)
ON(C, A) ∧ ON(B, D) ∧ OTAD

We now attempt to satisfy the goal HOLDING(C). There are two operators that might make HOLDING(C) true: PICKUP(C) and UNSTACK(C, *x*), where *x* could be any block from which C could be unstacked.

The new goal stack is

CLEAR(x)

HOLDING(C)

CLEAR(x) $\wedge$ HOLDING(C)

STACK(C, x)

CLEAR(C)

ARMEMPTY

ON(C, x) $\wedge$ CLEAR(C) $\wedge$ ARMEMPTY

UNSTACK(C, x)

CLEAR(A) $\wedge$ HOLDING(C)

STACK(C, A)

ON(B, D)

ON(C, A) $\wedge$ ON(B, D) $\wedge$ OTAD by binding D to x in the STACK operator. This makes the goal stack

CLEAR(D)

HOLDING(B)

CLEAR(D) $\wedge$ HOLDING(B)

STACK(B, D)

ONTABLE(C) $\wedge$ CLEAR(C) $\wedge$ ARMEMPTY

PICKUP(C)

CLEAR(A) $\wedge$ HOLDING(C)

STACK(C, A)

ON(B,D).

ON(C, A) $\wedge$ ON(B, D) $\wedge$ OTAD

CLEAR(D) and HOLDING(B) are both true. Now the operation STACK(B, D) can be performed, producing the world model

$$ONTABLE(A) \wedge ONTABLE(C) \wedge ONTABLE(D) \wedge ON(B, D) \wedge ARMEMPTY$$

The problem solver halt and return the answer as