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Principles of AI

7.2. A FORWARD PRODUCTION SYSTEM

The simplest type of robot problem-solving system is a production system that uses the state description as the global database and the rules modeling robot actions as F-rules. In such a system, we select applicable F-rules to apply until we produce a state description that matches the goal expression. Let us examine how such a system might operate in a concrete example.

Consider the F-rules given below, in STRIPS-form, corresponding to a set of actions for the robot of Figure 7.1.

1) **pickup**(x)
   P & D: $ONTABLE(x)$, $CLEAR(x)$, $HANDEMPTY$
   A: $HOLDING(x)$

2) **putdown**(x)
   P & D: $HOLDING(x)$
   A: $ONTABLE(x)$, $CLEAR(x)$, $HANDEMPTY$

3) **stack**(x,y)
   P & D: $HOLDING(x)$, $CLEAR(y)$
   A: $HANDEMPTY$, $ON(x,y)$, $CLEAR(x)$

4) **unstack**(x,y)
   P & D: $HANDEMPTY$, $CLEAR(x)$, $ON(x,y)$
   A: $HOLDING(x)$, $CLEAR(y)$

Note that in each of these rules, the precondition formula (expressed as a list of literals) and the delete list happen to be identical. The first rule is the same as the rule that we used as an example in the last section. The others are models of actions for putting down, stacking, and unstacking blocks.

Suppose our goal is the state shown in Figure 7.2. Working forward from the initial state description shown in Figure 7.1, we see that **pickup**(B) and **unstack**(C,A) are the only applicable F-rules. Figure 7.3 shows the complete state-space for this problem, with a solution path indicated by the dark branches. The initial state description is labeled

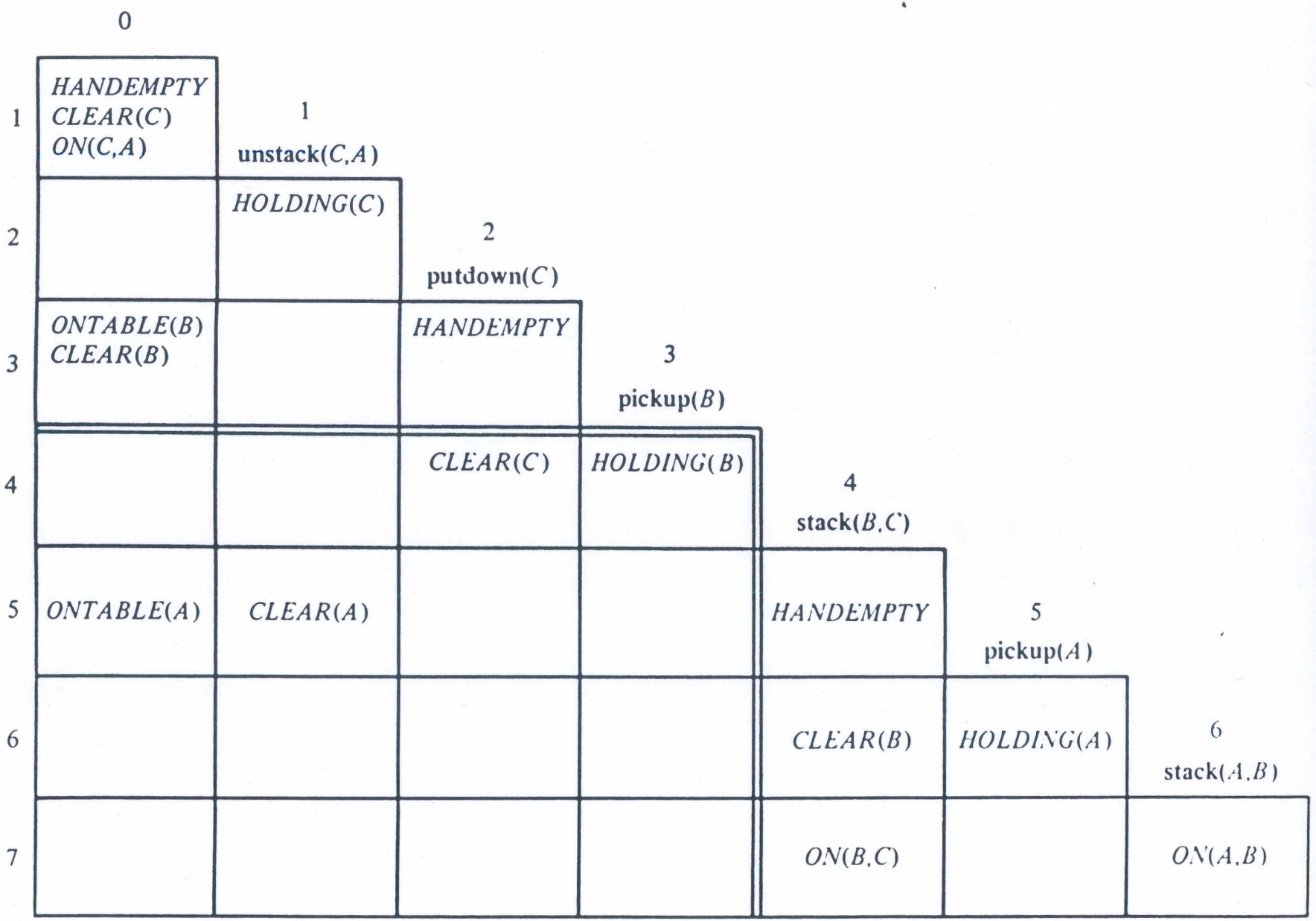

Fig. 7.4 A triangle table.

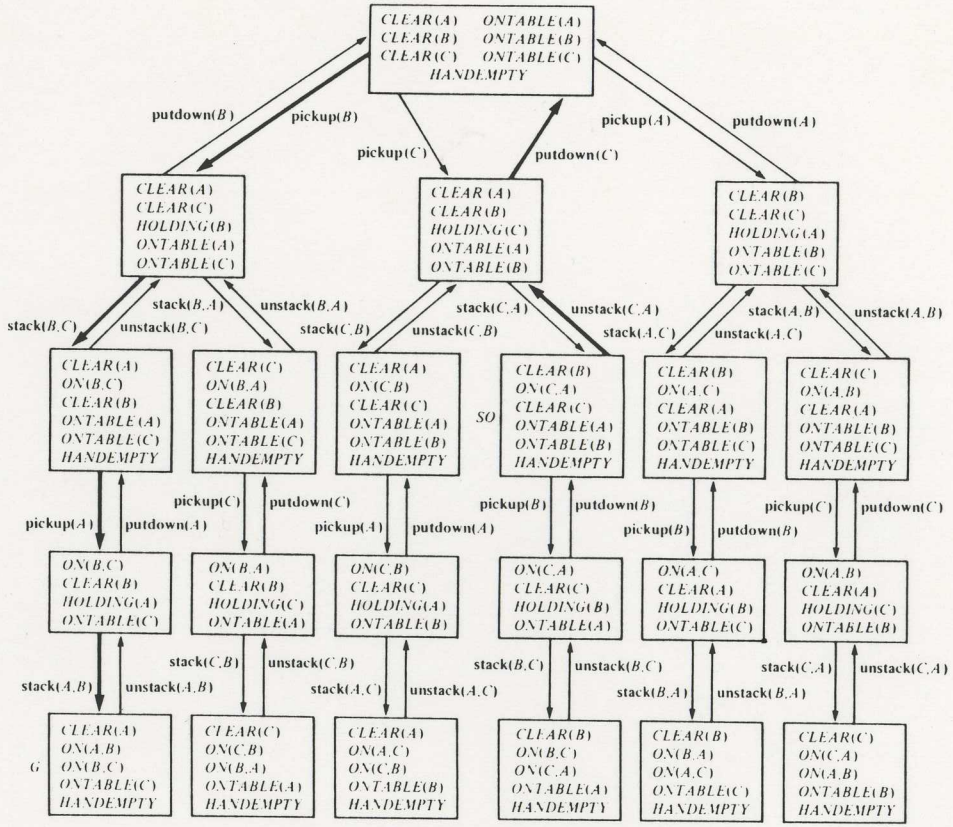

Fig. 7.3 The state-space for a robot problem.