The Theory of Computation
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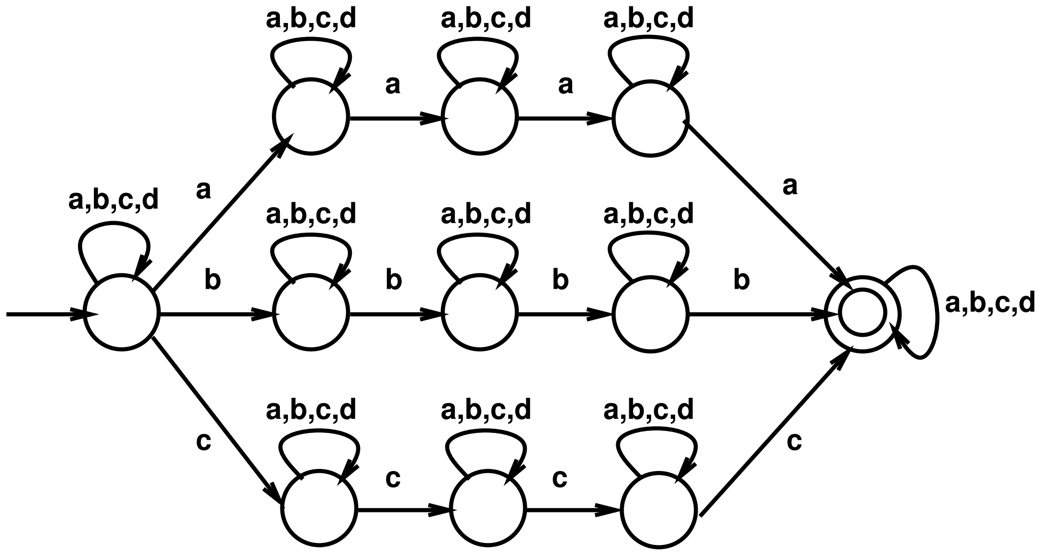
Addison-Wesley-Longman, 1998

Detailed Solution
Chapter 3, Problem 3.9, Part 3

The nondeterministic automaton simply guesses which of the 3 symbols will be the one to appear at least 4 times in all and proceeds to verify that. (Since there could be more than 4 appearances, we also let it guess which appearances it wants to count.)



A deterministic automaton is easy enough to build, but will need to keep track of the number of *a*s, of *b*s, and of *c*s seen so far, until one of them has been seen 4 times. So we will have states of the type "seen x *a*s, y *b*s, and z *c*s," for $0 \le x, y, z \le 3$, or at least $4^3 = 64$ states. The machine must have one more state for accepting and thus will have 65 states in all. Whenever it sees a d, it simply loops in place; whenever it sees one of the three symbols of interest, it moves to the state denoting the updated count, until it reaches the accepting state, which is a trap.