The Theory of Computation

Bernard M.E. Moret

Addison-Wesley-Longman, 1998

Solution Manual

Chapter 3, Problem 3.26

The language is regular. Given a DFA $M = (\Sigma, Q, S, F, \delta)$ for L, we construct an NFA $M' = (\Sigma, Q', S', F', \delta')$ for SUB(L) as follows. The idea is to allow M' to make any transition that M can make (corresponding to reading a character of the subsequence) and also to allow it to make an ε-transition instead—to the same state as the real transition in M. Thus we set $Q' = Q$, $S' = S$, and $F' = F$; if we have $\delta(q_i, a) = q_j$ in machine M, then we set $\delta'(q_i, a) = q_j$ and $q_j \in \delta'(q_i, \varepsilon)$. Our new machine accepts a string through a series of transitions that are a combination of ε-transitions and transitions of M; each ε-transition amounts to guessing that the complete string would have some character at that place that is not present in the subsequence and guessing which character that is (by moving to the proper guessed next state).