Problem

Prove that every NFA can be converted to an equivalent one that has a single accept state.

Step-by-step solution

Step 1 of 2

Let *M* be a NFA (non deterministic finite automatic)

Let *N* be the another NFA with single accept states q_{final}.

We go through every accept state *M* and do the following

(i) make it non – accepting state

(ii) add an $\in$-transition from that state to q_{final}

Then we will get NFA *N*.

If M has no accept states, then there will be no transitions coming into q_{final}.

Comment

Step 2 of 2

Now we will discuss this formally.

$M = (Q, \Sigma, \delta, q_0, F)$ then

$N = (Q \cup \{q_{\text{final}}\}, \Sigma, \delta', q_0, \{q_{\text{final}}\})$ for any $q \in Q$ and $a \in \Sigma$

$$\delta'(q,a) = \begin{Bmatrix} \delta(q,a) \text{ if } a \neq \in \text{ or } q \notin F \\ \delta(q,a) \cup \{q_{\text{final}}\} \text{ if } a = \in \text{ and } q \in F \end{Bmatrix}$$

And $q'(q_{\text{final}}, a) = \phi$

Thus we get *N* by simply making every accept state of *M* as non – accepting state and adding an $\in -$ transition from that state to q_{final}

Thus M is equivalent to N.

Thus every NFA is converted to an equivalent one that has single accept state.

Comments (3)