

Theory of Computation, CSCI 438 spring 2022

Regular expressions describe regular languages, pg. 66-69, Jan. 28

1.15 Give a counter example to show that the construction fails to prove Theorem 1.49, the closure of the class of regular languages under the star operation.

Let $N_1 = (Q_1, \Sigma, \delta_1, q_1, F_1)$ recognize A_1 . Construct $N = (Q_1, \Sigma, \delta, q_1, F)$ as follows. N is supposed to recognize A_1^* .

- a. The state of N are the states of N_1 .
- b. The start state of N is the same as the start state of N_1 .
- c. $F = \{q_1\} \cup F_1$.
The accept states F are the old accept states plus its start state.
- d. Define δ so that for any $q \in Q_1$ and any $a \in \Sigma_\epsilon$
$$\delta(q, a) = \begin{cases} \delta_1(q, a) & \text{for } q \notin F_1 \text{ or } a \neq \epsilon \\ \delta_1(q, a) \cup \{q_1\} & \text{for } q \in F_1 \text{ and } a = \epsilon \end{cases}$$

(Suggestion: Show this construction graphically, as in Figure 1.50.)

1.19 Use the procedure described in lemma 1.55 to convert the following regular expression to an NFA.

b. $((00)^*(11) \cup 01)^*$