Theory of Automata – Home Work 8

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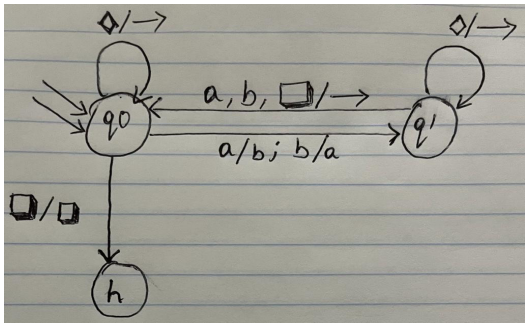
1. Let M = (K, Σ, δ, s, {h}), where
   K = {q0, q1, h},
   Σ = {a, b, ❑, □},
   s = q0, and δ is given by the following table,

q	σ	δ(q, σ)
q0	a	(q1, b)
q0	b	(q1, a)
q0	❑	(h, ❑)
q0	□	(q0, →)
q1	a	(q0, →)
q1	b	(q0, →)
q1	❑	(q0, →)
q1	□	(q1, →)

(a) Trace the computation of M starting from the configuration (q0, □aabbba).
(b) Describe informally what M does when started in q0 on any square of a tape.

Sol : (a)



q0, □aabbba
q1, □babbba
q0, □babbba
q1, □bbbbba
q0, □bbbbba
q1, □bbabba
q0, □bbabba
q1, □bbaaba
q0, □bbaaba
q1, □bbaaaa
q0, □bbaaaa
q1, □bbaaab
q0, □bbaaab❑
h, □bbaaab❑

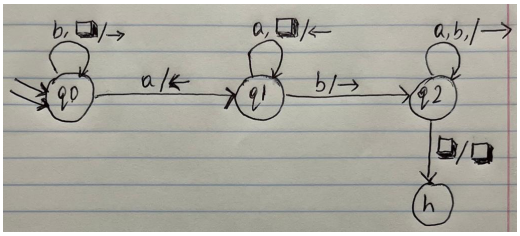
(b) Converts all a's to b's, & vice versa, starting from the current symbol and moving towards right

2. M = (K, Σ, δ, s, {h}), where
K = {q0, q1, q2, h},
Σ = {a, b, ❑, □},
s = q0,
and δ is given by the following table (the transitions on □ are δ(q, □) = (q, □), and are omitted).

q	σ	δ(q,σ)
q0	a	(q1, ←)
q0	b	(q0, →)
q0	❑	(q0, →)
q1	a	(q1, ←)
q1	b	(q2, →)
q1	❑	(q1, ←)
q2	a	(q2, →)
q2	b	(q2, →)
q2	❑	(h, ❑)

Start from the configuration (q0, □abb❑bb❑❑❑aba).

Sol :



q0, □abb❑bb❑❑❑aba
q0, □abb❑bb❑❑❑aba
q0, □abb❑bb❑❑❑aba …
q0, □abb❑bb❑❑❑aba
q1, □abb❑bb❑❑❑aba …
q1, □abb❑bb❑❑❑aba
q2, □abb❑bb❑❑❑aba
h, □abb❑bb❑❑❑aba