

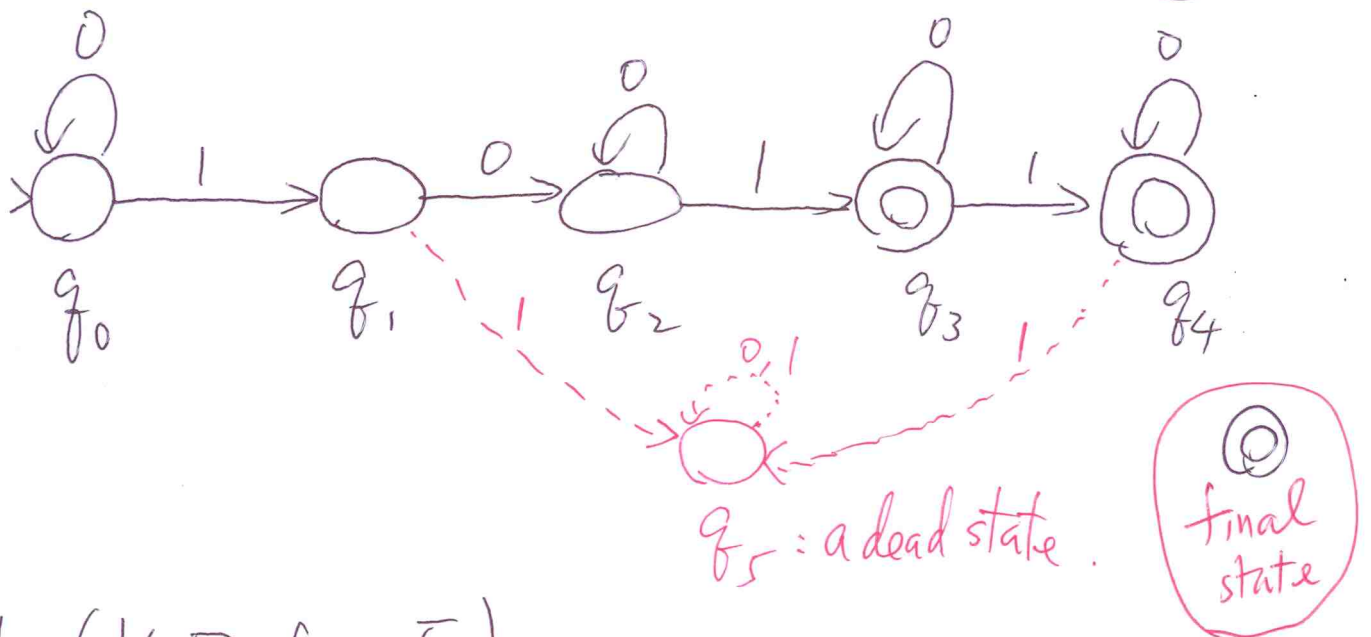
DFA

Kun-Mao Chao

$$\alpha = 0^* 1 0 0^* 1 0^* (10^* \cup \phi^*)$$

$L(\alpha) = \{w \in \{0,1\}^* : w \text{ has two or three occurrences of } 1, \text{ the first and second of which are not consecutive}\}$

$M$  : a deterministic finite automaton for recognizing  $L(\alpha)$ . The language recognized by  $M$  is denoted by  $L(M)$ .



$$M = (K, \Sigma, \delta, s, F)$$

$$K = \{q_0, q_1, q_2, q_3, q_4, q_5\}$$

$$\Sigma = \{0, 1\}$$

$$s = q_0$$

$$F = \{q_3, q_4\}$$

$$\delta: \delta(q_0, 0) = q_0$$

$$\delta(q_0, 1) = q_1$$

$$\delta(q_1, 0) = q_2$$

$$\delta(q_1, 1) = q_5$$

Is  $0101100100 \in \mathcal{L}(M)$ ?

$$(q_0, 0101100100) \vdash_M (q_0, 101100100)$$

$$\vdash_M (q_1, 01100100)$$

$$\vdash_M (q_2, 1100100)$$

$$\vdash_M (q_3, 100100)$$

$$\vdash_M (q_4, 00100)$$

$$\vdash_M (q_4, 0100)$$

$$\vdash_M (q_4, 100)$$

$$\vdash_M (q_5, 00)$$

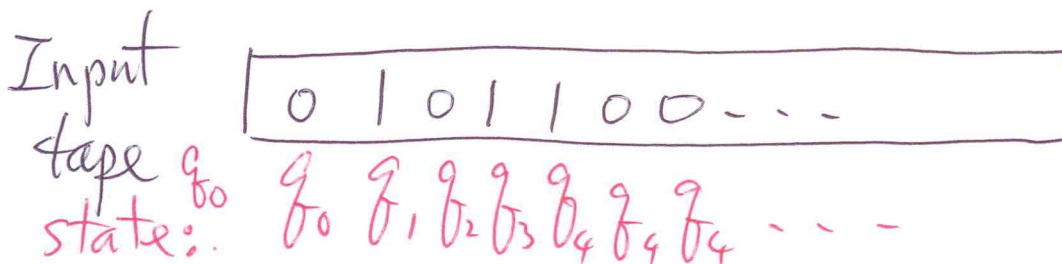
$$\vdash_M (q_5, 0)$$

$$\vdash_M (q_5, \epsilon) \quad \text{not accepted.}$$

Is  $0101100 \in \mathcal{L}(M)$ ?

$$(q_0, 0101100) \vdash_M^* (q_4, \epsilon)$$

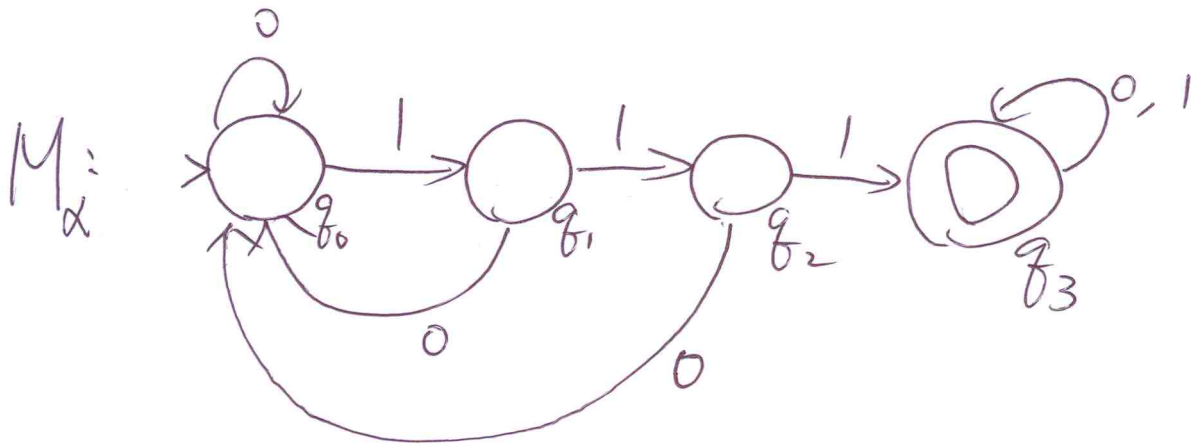
accepted.



Ex.

$$\alpha = ((0U1)^* 111 (0U1)^*)$$

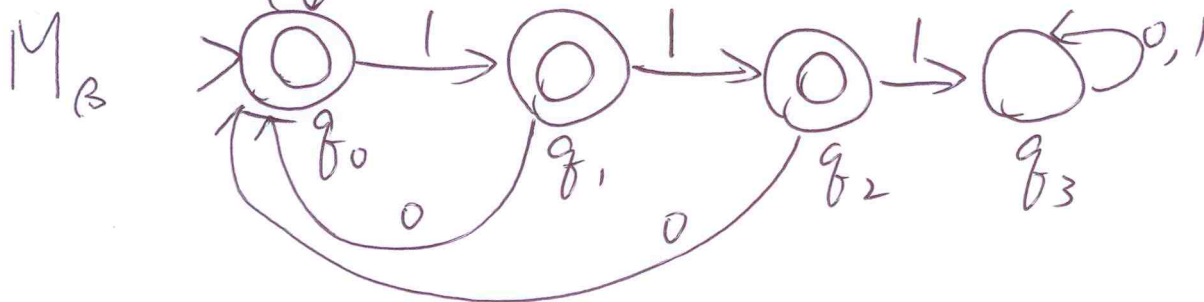
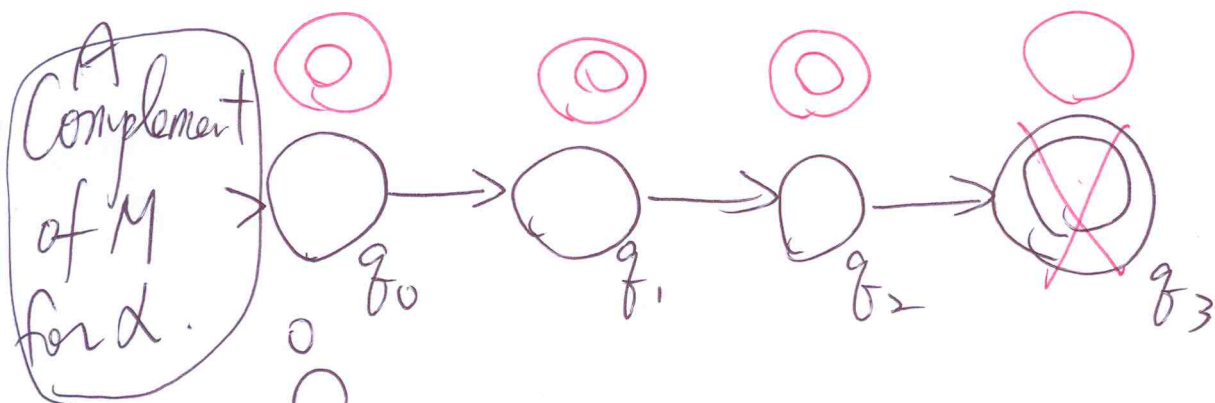
$$\mathcal{L}(\alpha) = \{w \in \{0,1\}^* : w \text{ has the substring } 111\}$$



Ex.

$$\beta = 0^* \cup 0^* (1U111) (00^* (1U111))^* 0^*$$

$$\mathcal{L}(\beta) = \{w \in \{0,1\}^* : w \text{ does not have the substring } 111\}$$



Ex. Is 01101110 accepted by  $M_x$ ?

$$(q_0, 01101110) \vdash_{M_x} (q_0, 1101110)$$

$$\vdash_{M_x} (q_1, 101110)$$

$$\vdash_{M_x} (q_2, 01110)$$

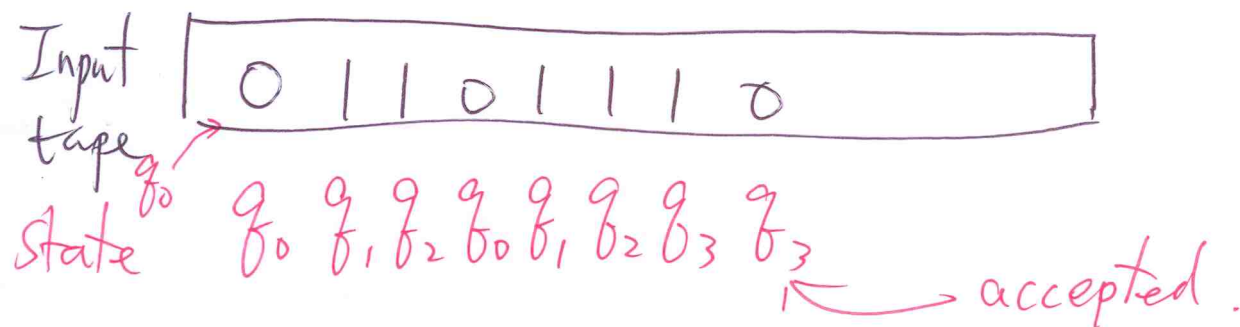
$$\vdash_{M_x} (q_0, 1110)$$

$$\vdash_{M_x} (q_1, 110)$$

$$\vdash_{M_x} (q_2, 10)$$

$$\vdash_{M_x} (q_3, 0)$$

$$\vdash_{M_x} (q_3, \epsilon) \quad \text{accepted.}$$



$$(q_0, 01101110) \vdash_{M_x}^* (q_3, \epsilon)$$