

ECE374 Assignment 2

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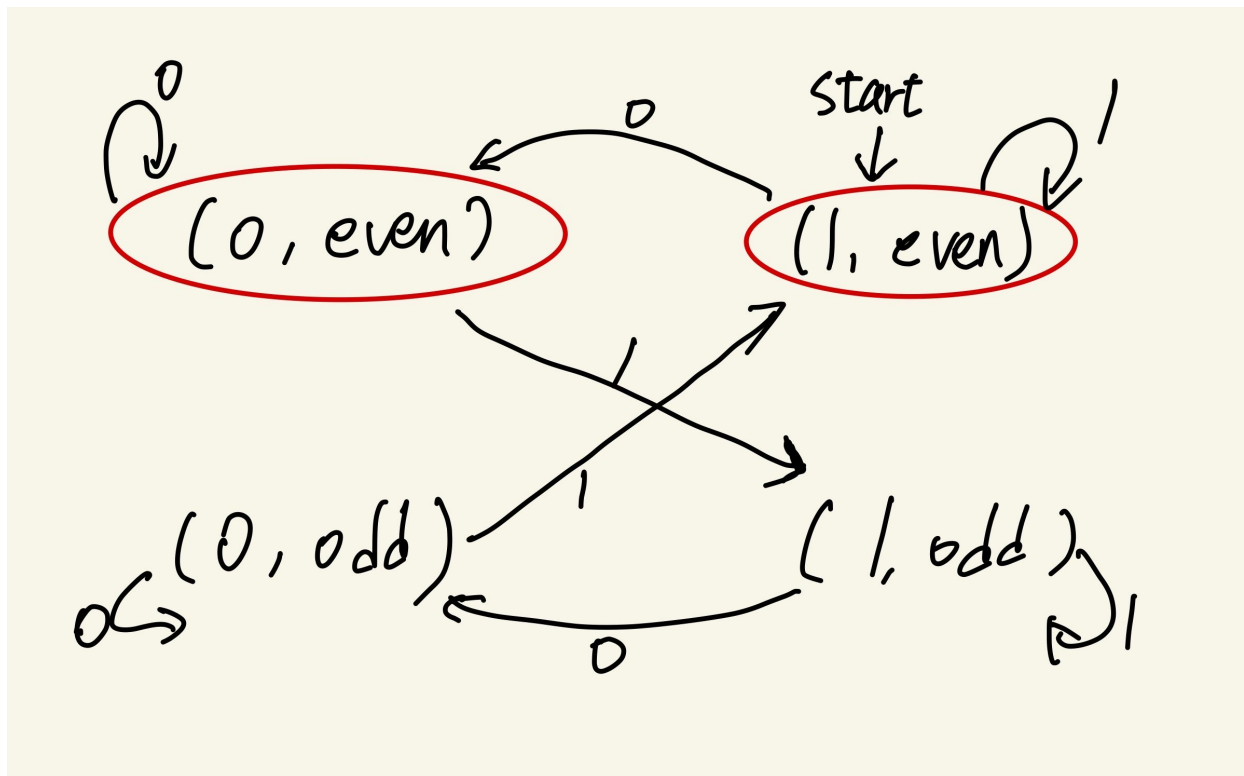
Shitian Yang sy39

T1

a) i)

$Q = \{0,1\} \times \{\text{even}, \text{odd}\}$

$s = (1, \text{even})$



$\delta((1, a), b) = (b, a)$ #if it ends with 1, so updates the end but do not affect the even or odd

$\delta((0, a), 0) = (0, a)$ #if it ends with 0 but continue with 0, but do not affect the even or odd

$\delta((0, \text{even}), 1) = (1, \text{odd})$ #if it ends with 0 but continue with 1, so change the even to odd

$\delta((0, \text{odd}), 1) = (1, \text{even})$ #if it ends with 0 but continue with 1, so change the odd to even

$A = \{(b, \text{even})\}$ #even means it has even number "01"

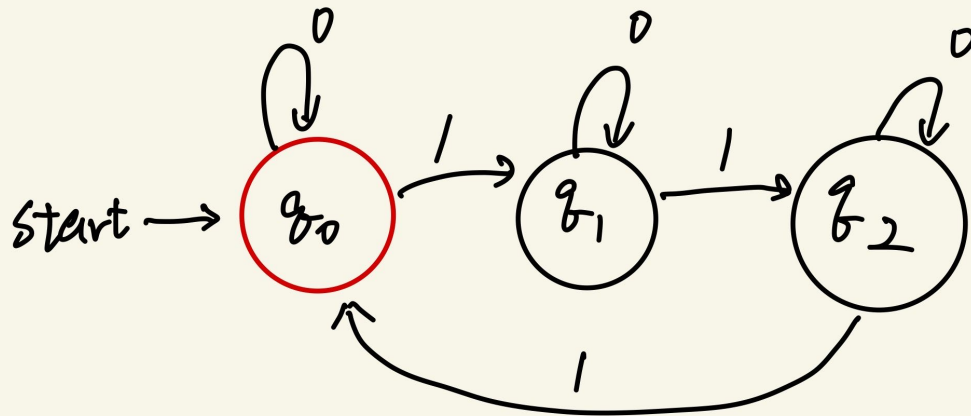
where $a \in \{\text{even}, \text{odd}\}$

where $b \in \{0,1\}$

ii)

$Q=\{0,1,2\}$

$s=0$



$\delta(a, b) = (a + b) \bmod 3$ # because we only count 1, but 0 do not affect the mod3, so just use add to count 1

$A=\{0\}$ # means the number of 1 can be divided by 3

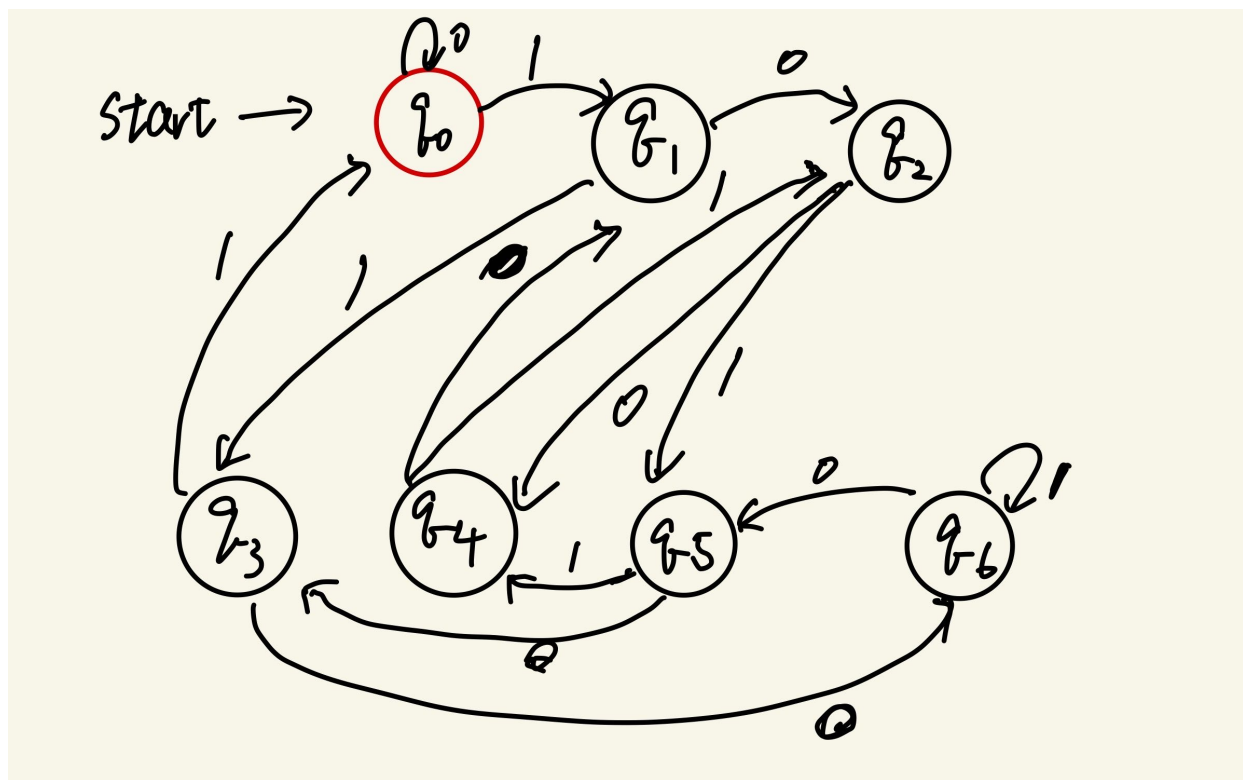
where $a \in \{0,1,2\}$

where $b \in \{0,1\}$

iii)

$Q=\{0,1,2,3,4,5,6\}$

$s=0$



$\delta(a, b) = (2a + b) \bmod 7$ #every time append a element, previous number will be multiplied by two, which means its remainder will be multiplied too. so the new remainder is the previous one be multiplied by two and add the new element, and then mod 7

$A = \{0\}$ #means the number can be divided by 7

where $a \in \{0, 1, 2, 3, 4, 5, 6\}$

where $b \in \{0, 1\}$

b)

$Q = \{0, 1\} \times \{\text{even}, \text{odd}\} \times \{0, 1, 2\} \times \{0, 1, 2, 3, 4, 5, 6\}$

$s = (1, \text{even}, 0, 0)$

$\delta((1, a, b, c), d) = (d, a, (b + d) \bmod 3, (2c + d) \bmod 7)$ # these four equations are the combination of previous 3L

$\delta((0, a, b, c), 0) = (0, a, b, (2c) \bmod 7)$

$\delta((0, \text{even}, b, c), 1) = (1, \text{odd}, (b + 1) \bmod 3, (2c + 1) \bmod 7)$

$\delta((0, \text{odd}, b, c), 1) = (1, \text{even}, (b + 1) \bmod 3, (2c + 1) \bmod 7)$

$A = \{0, 1\} \times \{\text{even}, \text{odd}\} \times \{0, 1, 2\} \times \{0, 1, 2, 3, 4, 5, 6\} - (k, \text{even}, 0, 0)$ # $(k, \text{even}, 0, 0)$ means it fits all Ls, so just minus it from the universal set

where $a \in \{\text{even}, \text{odd}\}$

where $k \in \{0, 1\}$

where $b \in \{0, 1, 2\}$

where $c \in \{0, 1, 2, 3, 4, 5, 6\}$

where $d \in \{0, 1\}$

Actually, the Q , the union of Q_1, Q_2, Q_3 is used to represent those 3 status: the first 2 values used to represent L_1 , third one used to L_2 , fourth used to L_3 . the δ are the combination of 3 operations of L_1, L_2, L_3 , actually each part works independently. In order to denote at most 2, which means cannot denote all 3 conditions, just need to minus the status which is the union of the final status of L_1, L_2, L_3 from the universal set(Q set).