API - esercitazione 3 16/03/2021

TM a K-nastri

$$\langle Q, I, \Gamma, \delta, q_0, F \rangle$$

Γ: alfabeto dei nastri

$\not b \in I, \Gamma$ "blank"

$$\delta : Q \setminus F \times I \times \Gamma^K \longrightarrow Q \times \Gamma^K \times \underbrace{\{R, S, L\}^{K+1}}_{\text{movimento testine}}$$

Condizione di accettazione:

se arrivo ad uno stato finale, accetto

es.: $L = a^n b^{n/2} c^{n/2}$, $n \geq 1$, 1 nastro di mem.

Idea: ad ogni 'a' letta, scrivo una 'A' in mem.

↓

$Z_0 A A \dots A \cancel{b}$

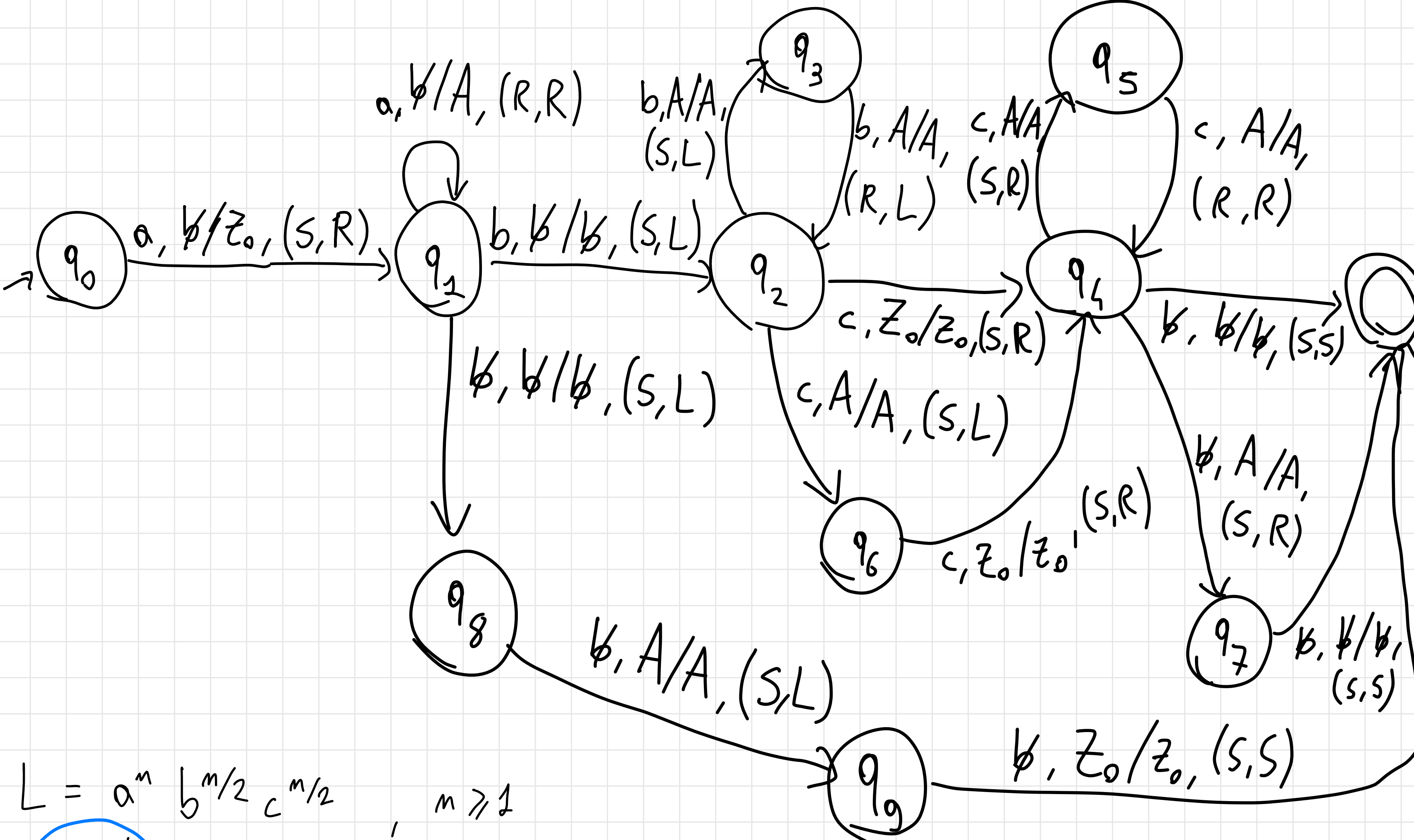
ad ogni 'b' letta, scorro due 'A' sul nastro

controllo ci sia 'Z_0'

$Z_0 A A \dots A \cancel{b}$

ad ogni 'c', procedura analoga, controllo '$\cancel{b}$'

$Z_0 A A \dots A \cancel{b}$



$L = a^n b^{n/2} c^{n/2}$, $n \geq 1$

$a \in L$

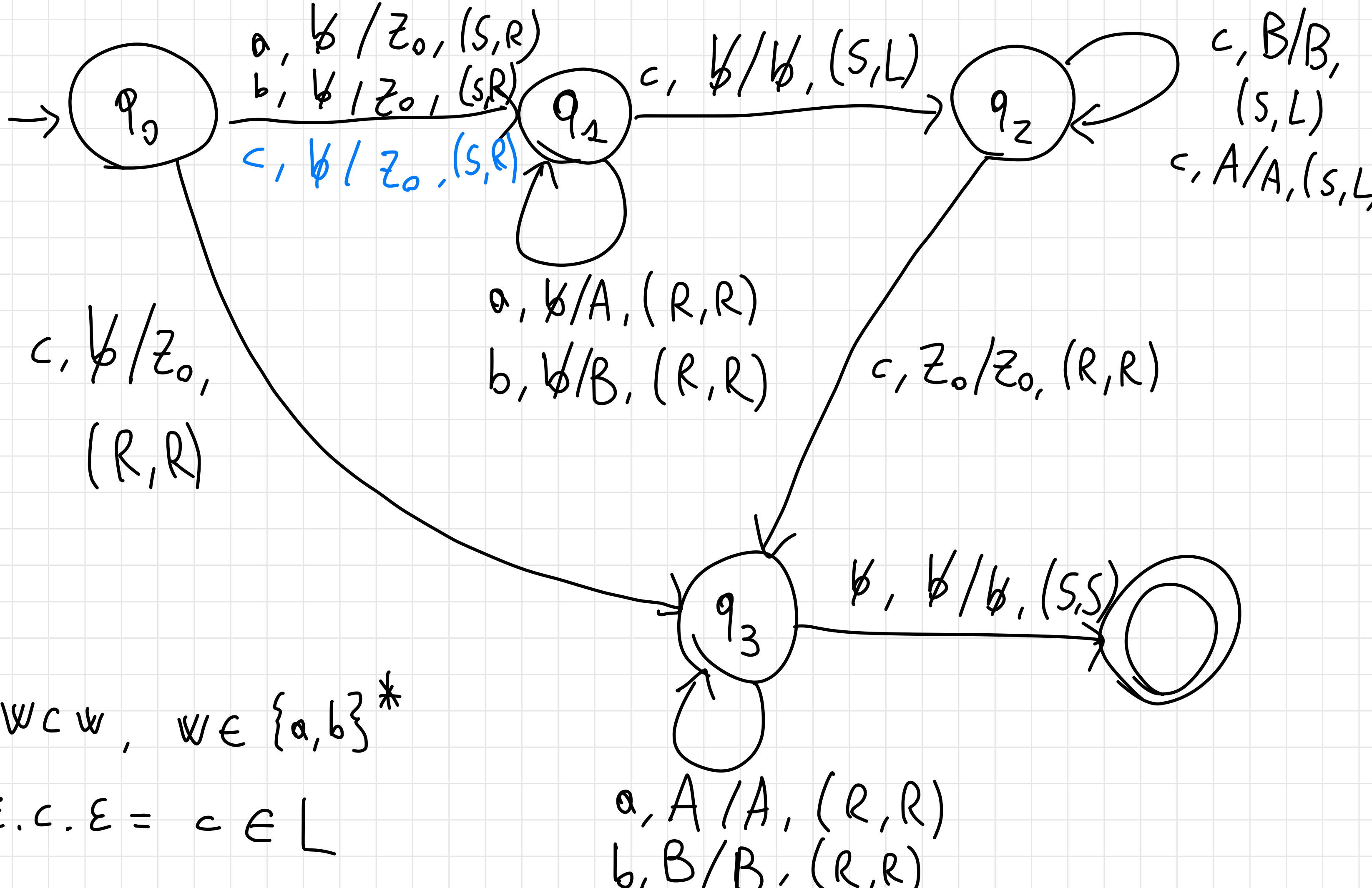
es. : $L = \{ wcw \mid w \in \{a, b\}^* \}$

Idea: ad ogni 'a' / 'b' letta, scrivo 'A' / 'B'

quando leggo 'c' $\rightarrow$ cambio fase

scorrere all'indietro il nastro fino a 'Z_0'

controllare che i caratteri di input corrispondano a quelli sul nastro



$wcw, \ w \in \{a,b\}^*$

$\varepsilon . c . \varepsilon = c \in L$

es.: $L = \{ wcw \mid w \in \{a,b\}^* \} \cup \{ wcw^R \mid w \in \{a,b\}^* \}$

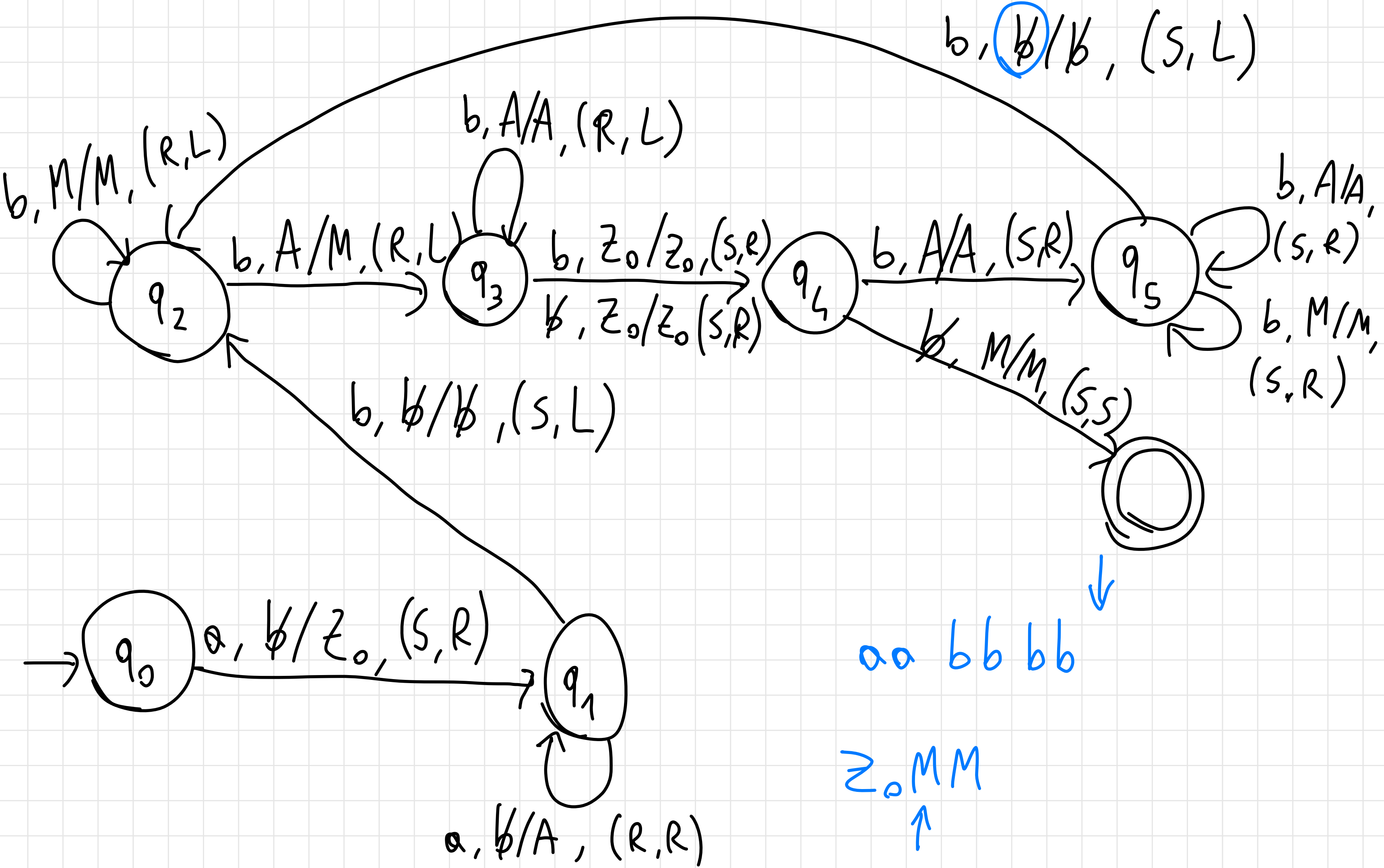
Idea: usare 2 nastri: uno come pila, l'altro come coda

MT a 1 nastro?

sulle slide

es.: $L = \{ a^n b^{n^2}, n \geq 1 \}$, 1 nastro di mem.

$n^2 = n \cdot n \rightarrow$ scorrere n volte un nastro lungo n


q0
q1
q2
q3
q4
q5
a, b̸/Z0, (S,R)
a, b̸/A, (R,R)
b, b̸/b̸, (S,L)
b, M/M, (R,L)
b, A/M, (R,L)
b, A/A, (R,L)
b, Z0/Z0, (S,R)
b̸, Z0/Z0 (S,R)
b, A/A, (S,R)
b, A/A, (S,R)
b, M/M, (S,R)
b, b̸/b̸, (S,L)
b̸, M/M, (S,S)
aa bbbb
Z0MM

es.: $L = \{a^n b^{n^2},\ n \geq 1\}^c$

$$\underbrace{\#_b(w) = \#_a(w)^2}_{A} \quad \wedge \quad \underbrace{a^+ b^*}_{B}$$

$$A \wedge B$$

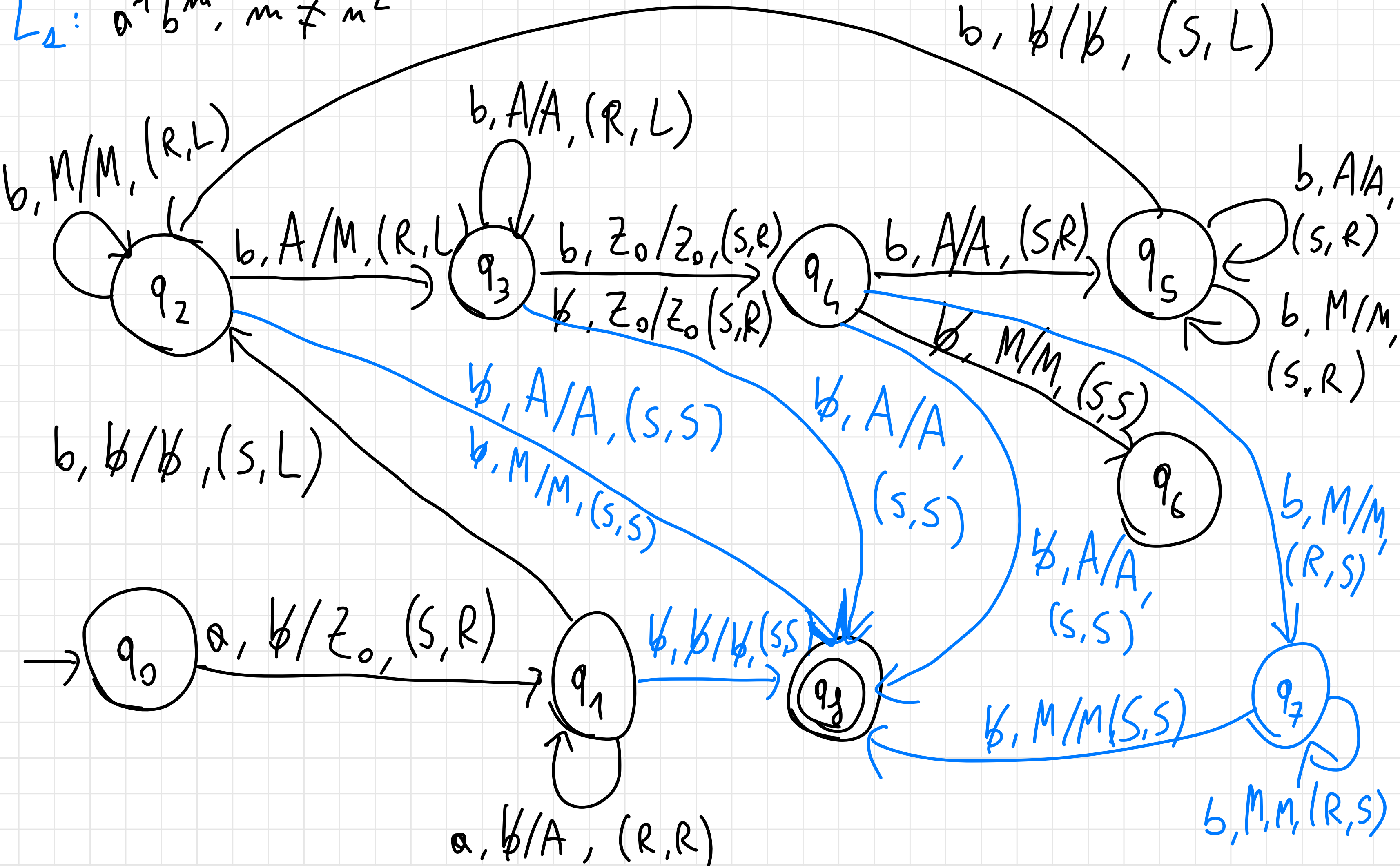
$$\neg(A \wedge B) = \neg A \vee \neg B$$

$L_1 = \{a^n b^m,\ n \geq 1,\ m \geq 0,\ m \neq n^2\}$

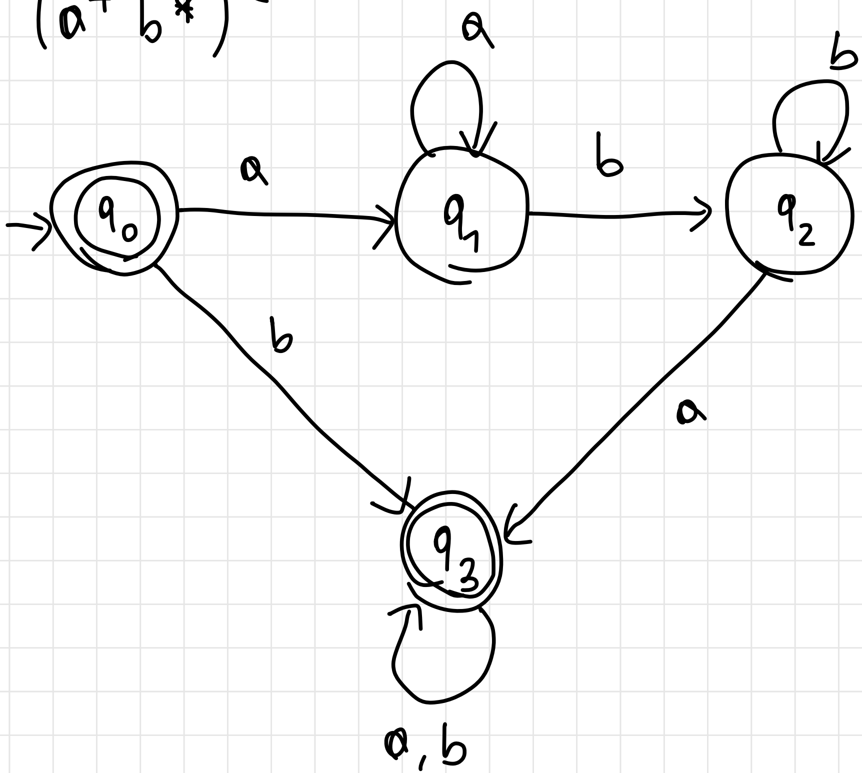
$L_2 = (a^+ b^*)^c$

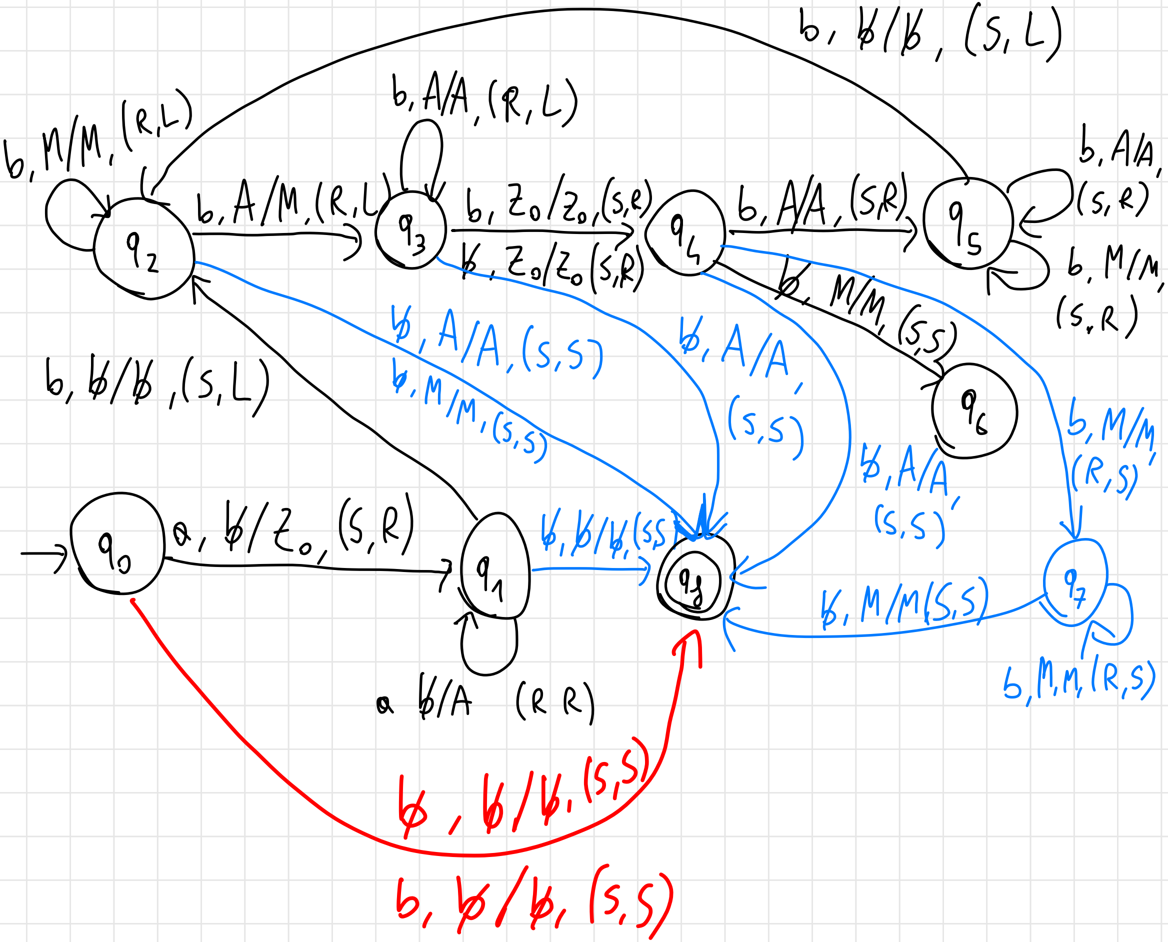
$L_1 \cup L_2$

$L_1: a^n b^m, \ m \neq n^2$

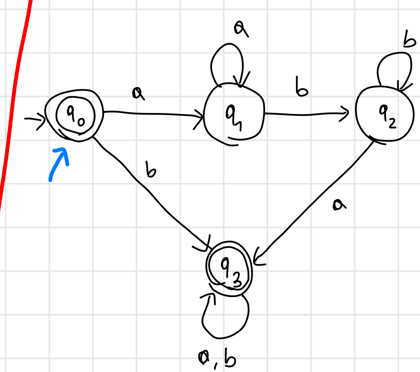


L_2: $(a^+ b^*)^c$



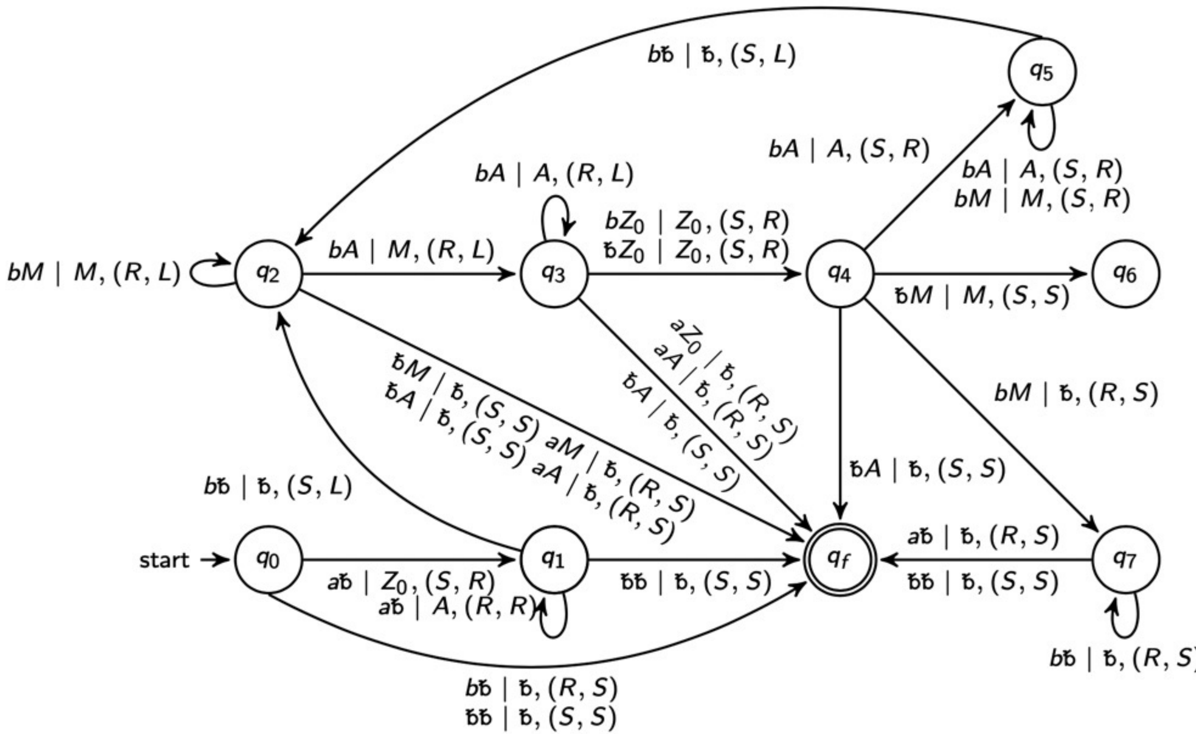


b, ƀ/ƀ, (S, L)
b, A/A, (R, L)
b, M/M, (R,L)
b, A/M, (R,L)
b, Z_0/Z_0, (S,R)
ƀ, Z_0/Z_0 (S,R)
b, A/A, (S,R)
b, A/A, (S, R)
b, M/M, (S, R)
ƀ, M/M, (S,S)
b, ƀ/ƀ, (S, L)
ƀ, A/A, (S,S)
ƀ, M/M, (S,S)
ƀ, A/A, (S,S)
ƀ, A/A, (S,S)
b, M/M, (R,S)
q_0
q_1
q_2
q_3
q_4
q_5
q_6
q_7
q_f
a, ƀ/Z_0, (S,R)
ƀ, ƀ/ƀ, (S,S)
a ƀ/A (R R)
ƀ, M/M (S,S)
b, M,M, (R,S)
ƀ, ƀ/ƀ, (S,S)
b, ƀ/ƀ, (S,S)



q_0
q_1
q_2
q_3
a
b
a
b
b
a
a, b

Correct TM for $L = \{a^n b^{n^2}, n \geq 1\}^C$:



sulle slide: es. sul traduttore

es.:

$$L_1 = \{ a^n b^{n/2} c^{n/2} , n \geq 1 \} \quad \text{TM}$$

$$L_2 = \{ a^n b^n \mid n \geq 1 \} \cup \{ a^n c^n \mid n \geq 1 \} \quad \text{PDA}$$

$$L_3 = \{ a^n b^n \mid 1 \leq n \leq 20 \} \quad \text{FSA}$$

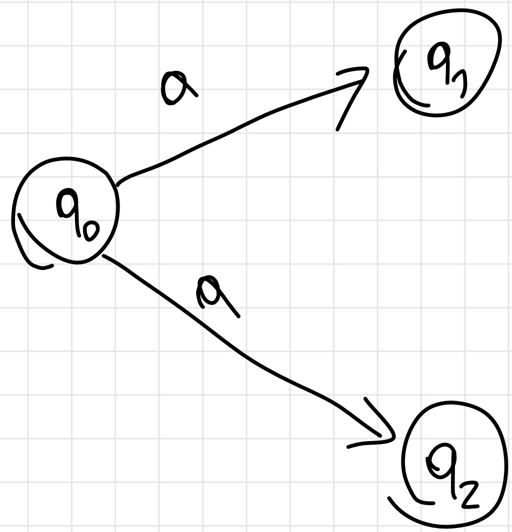
$$L_4 = \{ a^n b^n b^n \mid n \geq 1 \} \equiv \{ a^n b^{2n} \mid n \geq 1 \} \quad \text{PDA}$$

$$L_5 = \{ a^n b^{2n} a^n \mid n \geq 1 \} \quad \text{TM}$$

$$L_6 = \{ a^i b^j c^k \mid i + k = j \} \equiv \{ a^i b^i b^k c^k \} \quad \text{PDA}$$

Non determinismo

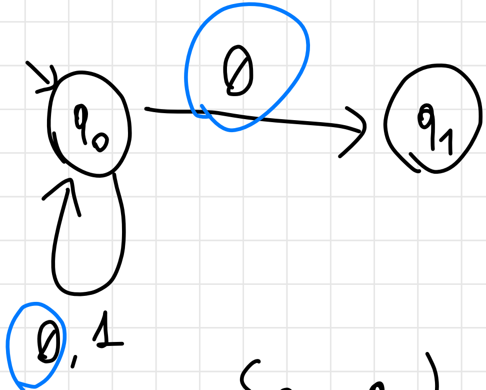
NFSA :



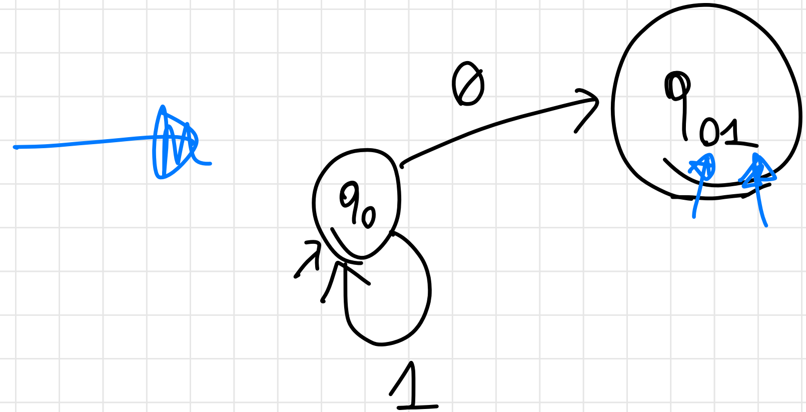
$$\delta(q_0, a) = \{q_1, q_2\}$$

Cond. di accettazione : $\exists$ un cammino fino ad uno degli stati finali

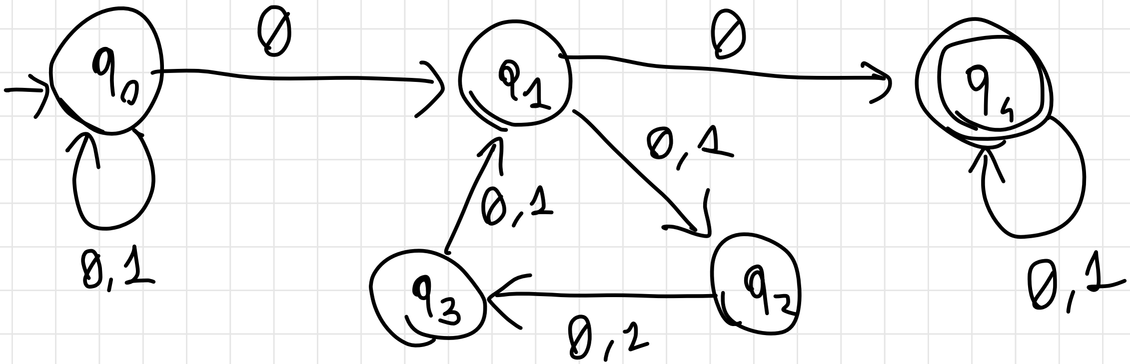
NFSA sono equivalenti (pot. espressiva) a FSA

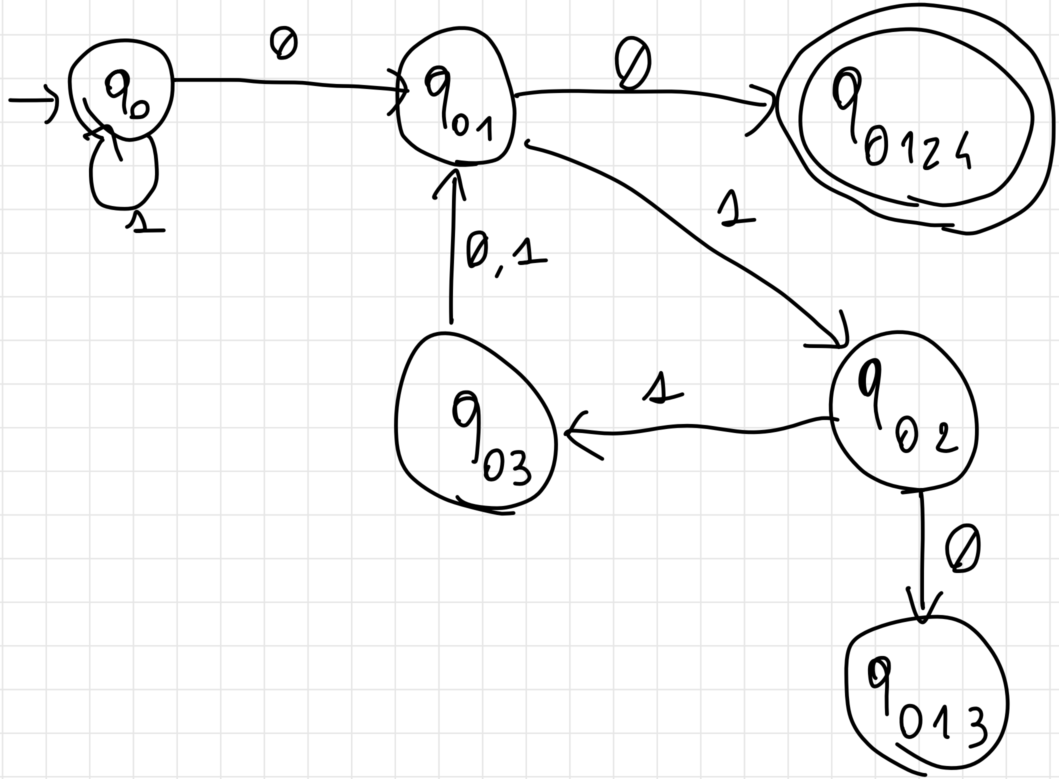


$\{q_0, q_1\}$



es. : $L = \underbrace{(0|1)}^{*} 0 \underbrace{(0|1)}^{3n} 0 (0|1)^{*}, \quad n \geq 0$

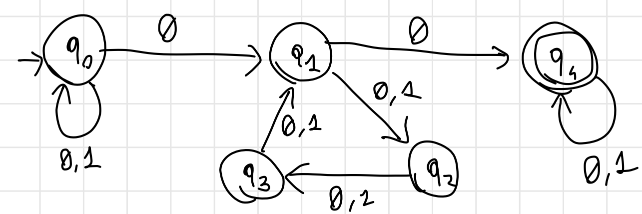




q_0
q_{01}
q_{0124}
q_{02}
q_{03}
q_{013}
0
0
1
1
1
0
0,1

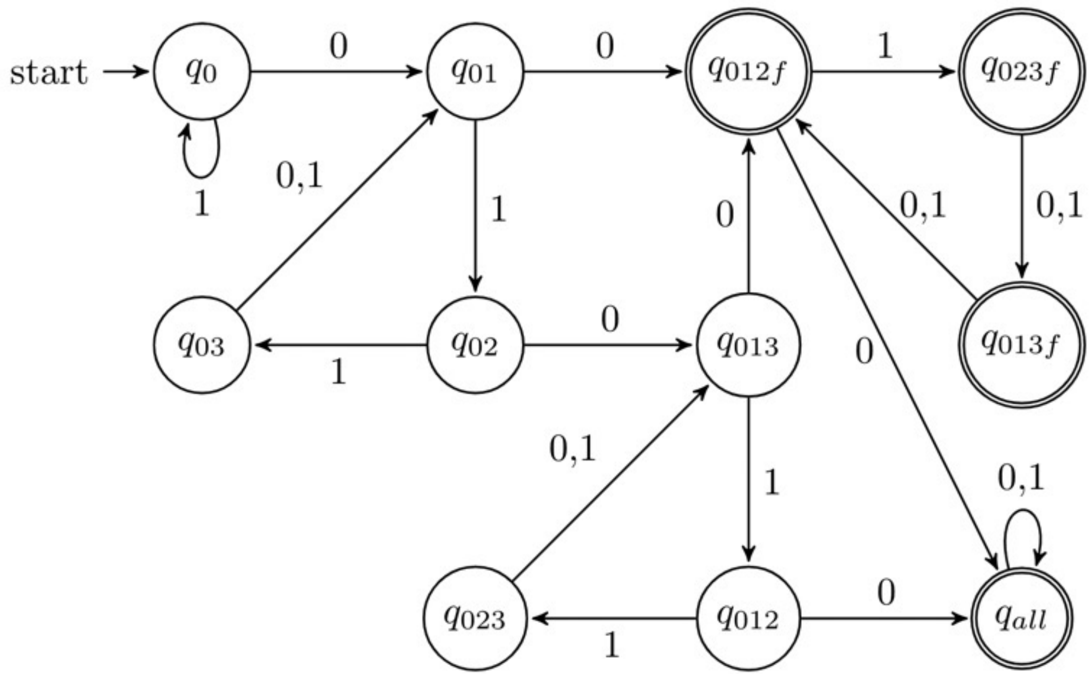
0 : 0 1

1 : 0 1



q_0
q_1
q_4
q_2
q_3
0
0
0,1
0,1
0,1
0,1
0,1

etc...



start
q_0
q_{01}
q_{012f}
q_{023f}
q_{03}
q_{02}
q_{013}
q_{013f}
q_{023}
q_{012}
q_{all}
0
0
1
1
0,1
1
0
0,1
0,1
1
0
0
0
0,1
1
1
0
0,1