Use of Arden's theorem

06 October 2023 14:03

Algebric method using Arden's Theorem

Conditions

i) FA has no λ-move

ii) FA has only 1 initial state, q_1

iii) vertices are $q_1, q_2, \ldots, q_n$

iv) v_i is the RE representing set of strings by system at state q_i

v) α_{ij} denote label of edge from q_i to q_j

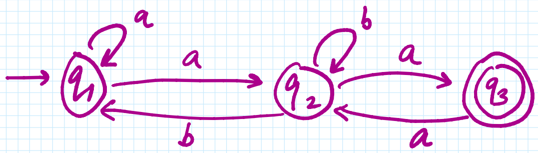
If no edge then $\alpha_{ij} = \phi$

$$q_1 = q_1\alpha_{11} + q_2\alpha_{21} + \cdots + q_n\alpha_{n1} + \lambda$$

$$q_2 = q_1\alpha_{12} + q_2\alpha_{22} + \cdots \; q_n\alpha_{n2}$$

$$\vdots$$

$$q_n = q_1\alpha_{1n} + q_2\alpha_{2n} + \cdots + q_n\alpha_{nn}$$



$$q_1 = q_1 a + q_2 b + \lambda$$

$$q_2 = q_1 a + q_2 b + q_3 a$$

$$q_3 = q_2 a$$

Replace q_3 in eqⁿ of q_2

$$\boxed{\begin{aligned} &R = Q + RP \\ &\Rightarrow R = QP^* \end{aligned}}$$

$$q_2 = q_1 a + q_2 b + q_2 aa$$

$$\underbrace{q_2}_{R} = \underbrace{q_1 a}_{Q} + \underbrace{q_2}_{R}\,(\underbrace{b + aa}_{P})$$

$$\Rightarrow \quad q_2 = q_1 a (b + aa)^*$$

$$\Rightarrow q_1 = q_1 a + q_1 a (b+aa)^* b + \lambda$$

$$\underset{R}{q_1} = \underset{R}{q_1}\,(\underbrace{a + a(b+aa)^* b}_{P}) + \underbrace{\lambda}_{Q}$$

$$= \lambda\,(a + a(b+aa)^* b)^*$$

$$\boxed{R = (a + a(b+aa)^* b)^*}$$

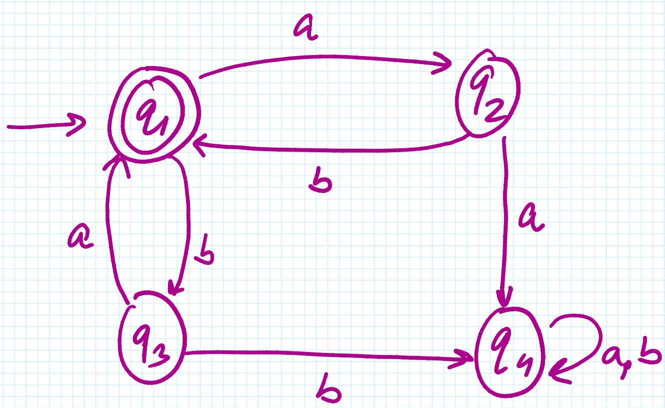
$$\boxed{q_1 = (a + a(b+aa)^* b)^*}$$

$$q_2 = (a + a(b+aa)^* b)^* a (b+aa)^*$$

$$q_3 = (a + a(b+aa)^* b)^* a (b+aa)^* a$$

a a b a a b a b a a b a

2)



Equal no. of a's & b's such that each prefix has at most one more a than b's and atmost one more b than a's.