

NFA- Λ , NFA, DFA dönüşümü
 \cup ve \cap kümelerinin DFA'sı örnekler

Örnek: Birleşim ve kesişim kümesinin DFA'sının bulunması

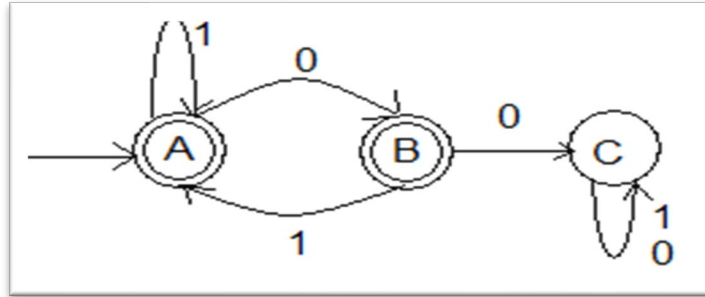
L_1 ve L_2 dilleri aşağıdaki gibi tanımlanmaktadır.

$L_1 = \{x \in (0,1)^* \mid x \text{ katarı } 00 \text{ alt katarı içermez}\}$

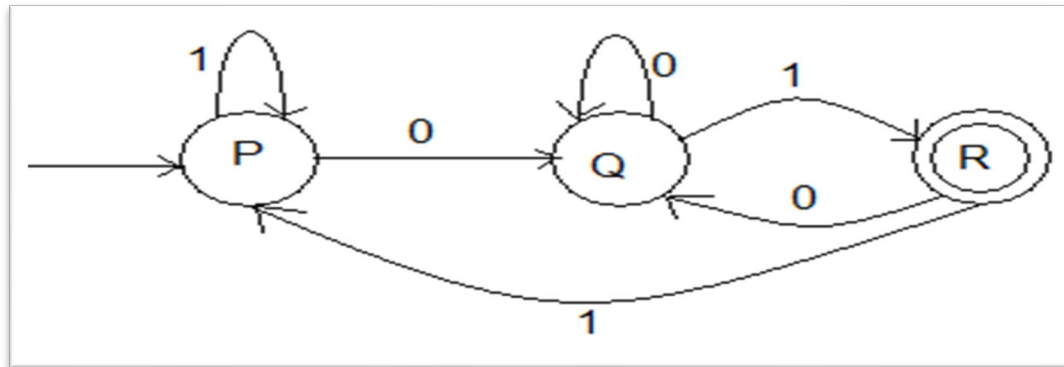
$L_2 = \{x \in (0,1)^* \mid x \text{ katarı } 01 \text{ ile biter}\}$

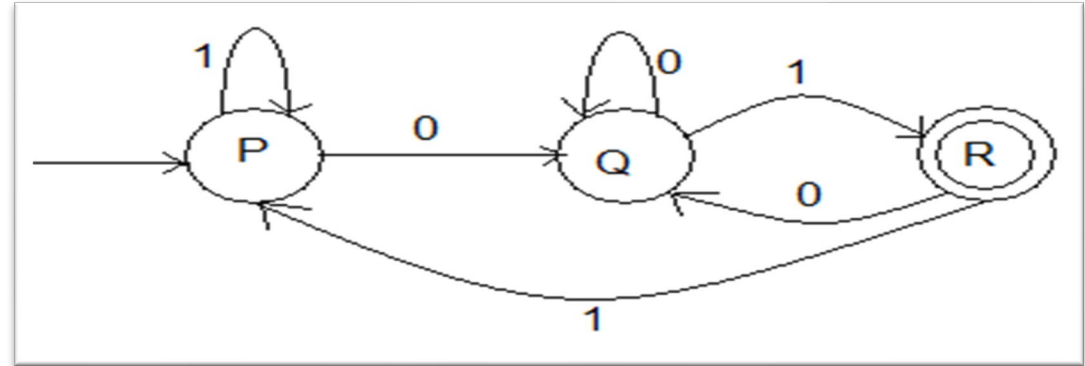
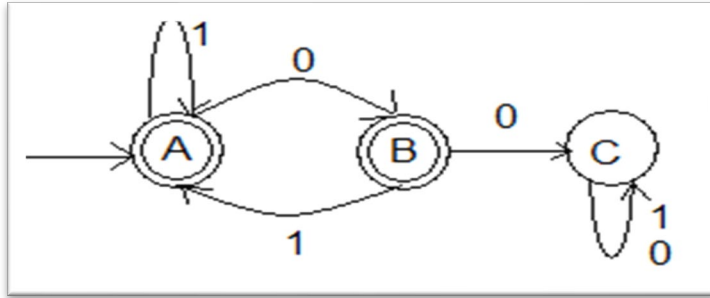
$L_1 \cup L_2$ ve $L_1 \cap L_2$ dillerini tanıtan DFA'yı çiziniz

$L1 = \{x \in (0,1)^* \mid x \text{ katarı } 00 \text{ alt katarı içermez}\}$



$L2 = \{x \in (0,1)^* \mid x \text{ katarı } 01 \text{ ile biter}\}$





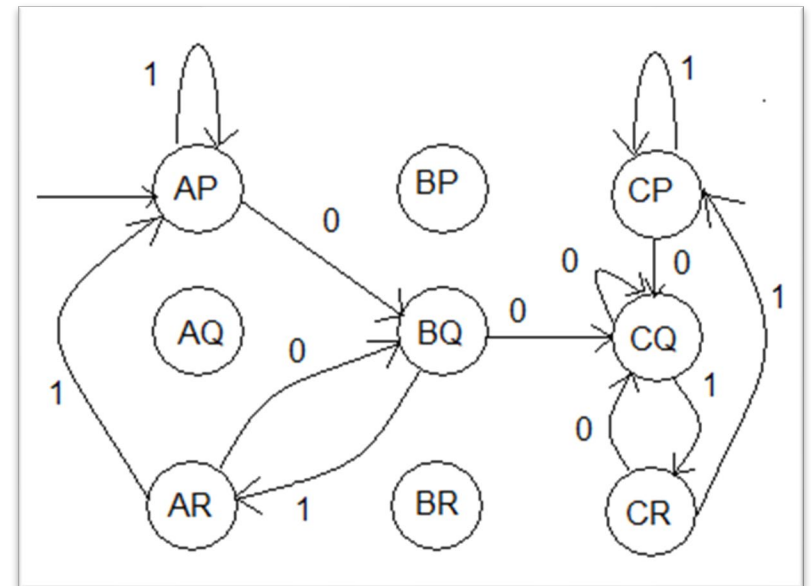
$$\delta(AP,0) = (\delta_1(A,0), \delta_2(P,0)) = BQ$$

$$\delta(AP,1) = (\delta_1(A,1), \delta_2(P,1)) = AP$$

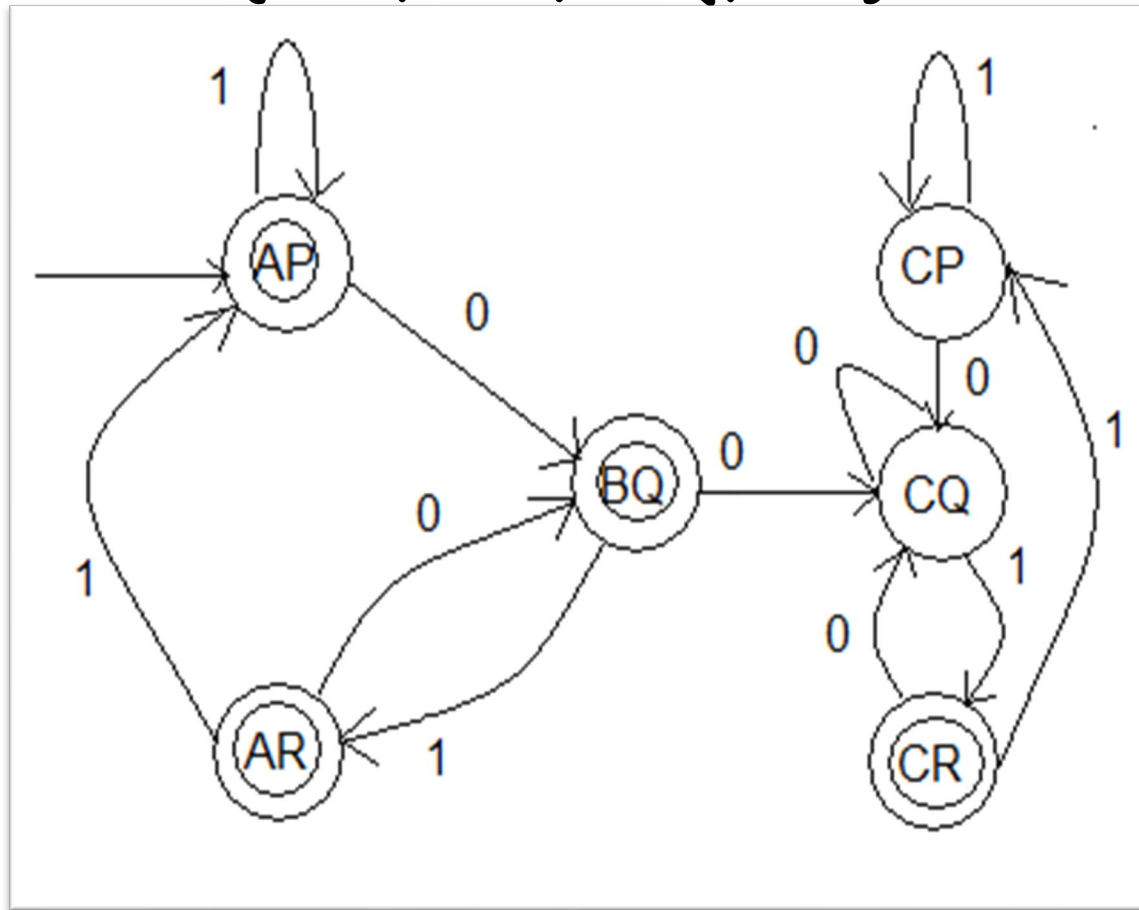
$$\delta(BQ,0) = (\delta_1(B,0), \delta_2(Q,0)) = CQ$$

$$\delta(BQ,1) = (\delta_1(B,1), \delta_2(Q,1)) = AR$$

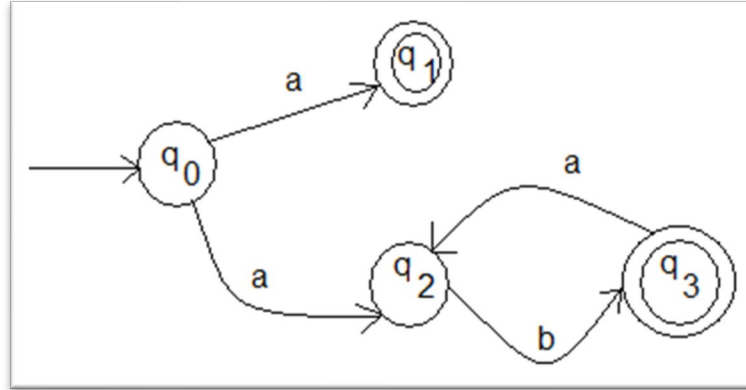
.....



$L1 \cup L2$
 $F = \{AP, AR, BQ, CR\}$



$a+(ab)^+$ regüler ifadesinin tanımlamış olduğu dili tanıyan NFA'yı çiziniz. Bu NFA'ya eşdeğer DFA'yı çiziniz.



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

$$\delta(q_0, b) = \Phi$$

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

$$\delta(\{q_1, q_2\}, b) = \{q_3\}$$

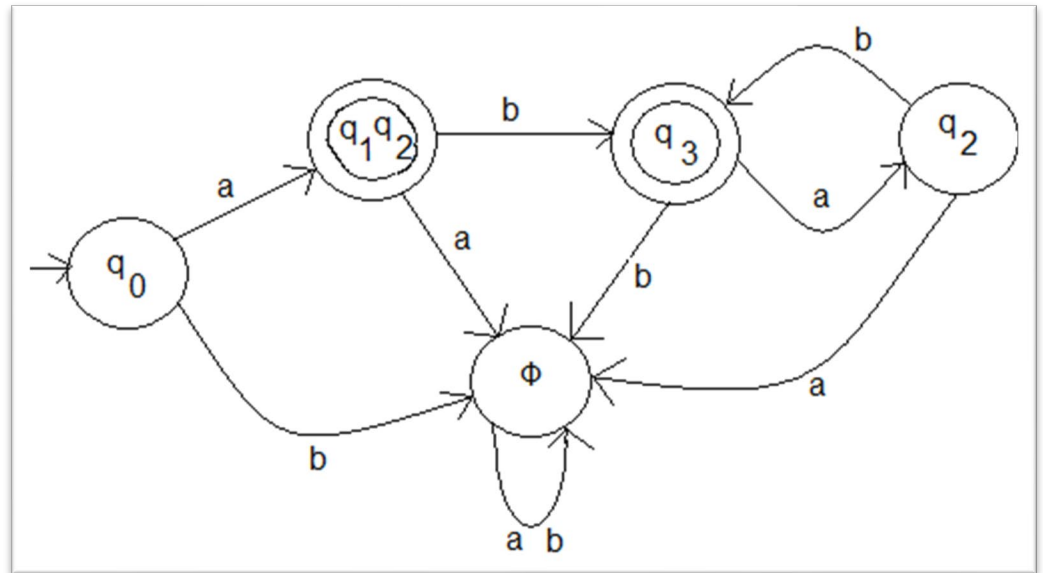
$$\delta(\Phi, a) = \delta(\Phi, b) = \Phi$$

$$\delta(q_3, a) = \{q_2\}$$

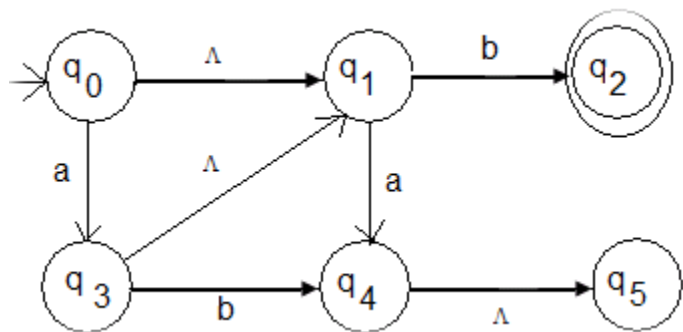
$$\delta(q_3, b) = \Phi$$

$$\delta(q_2, a) = \Phi$$

$$\delta(q_2, b) = \{q_3\}$$



Aşağıda verilen boşluk geçişli NFA'ya karşılık gelen NFA yı bulunuz.



$$\Lambda(q_0) = \{q_0, q_1\}$$

$$\delta(q_0, a) = \delta(\{q_0, q_1\}, a) = \delta(q_0, a) \cup \delta(q_1, a) = \{q_3, q_4\}$$

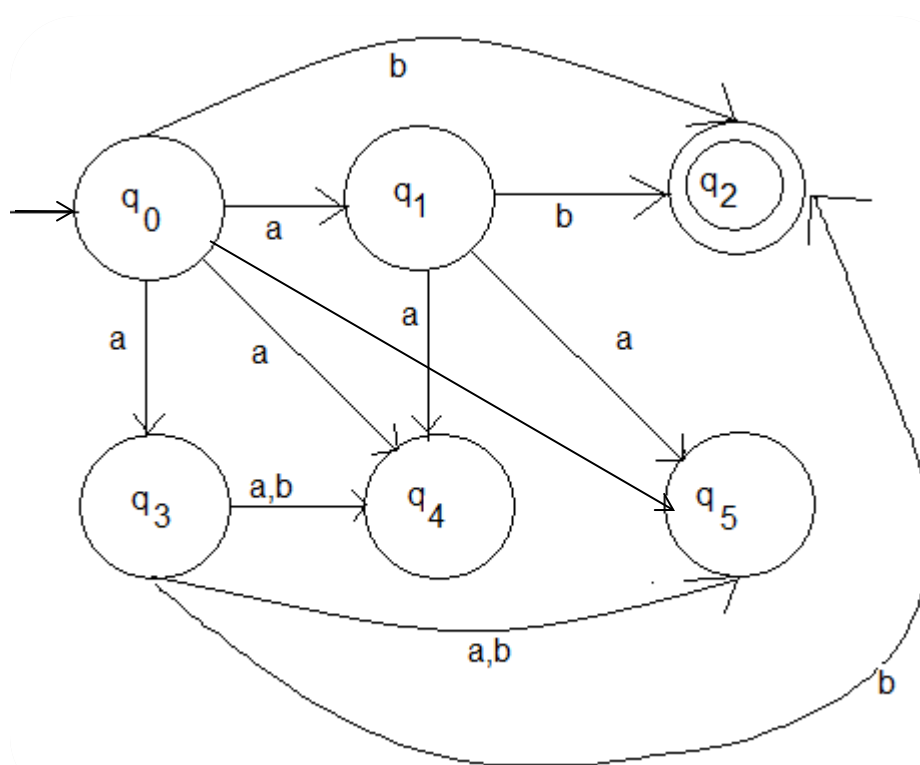
$$\Lambda(\{q_3, q_4\}) = \{q_1, q_3, q_4, q_5\}$$

q_0 'dan b simgesiyle ulaşabileceğim durumları listelemek için aşağıdaki adımlar uygulanır.

$$\Lambda(q_0) = \{q_0, q_1\}$$

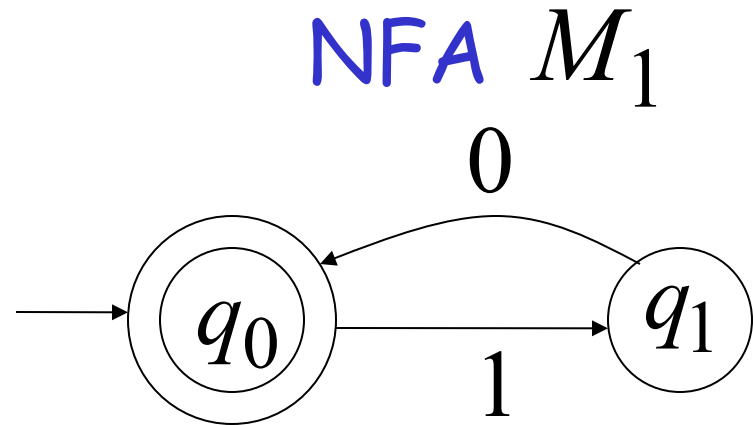
$$\delta(q_0, b) = \delta(\{q_0, q_1\}, b) = \delta(q_0, b) \cup \delta(q_1, b) = \{q_2\}$$

$$\Lambda(\{q_2\}) = \{q_2\}$$

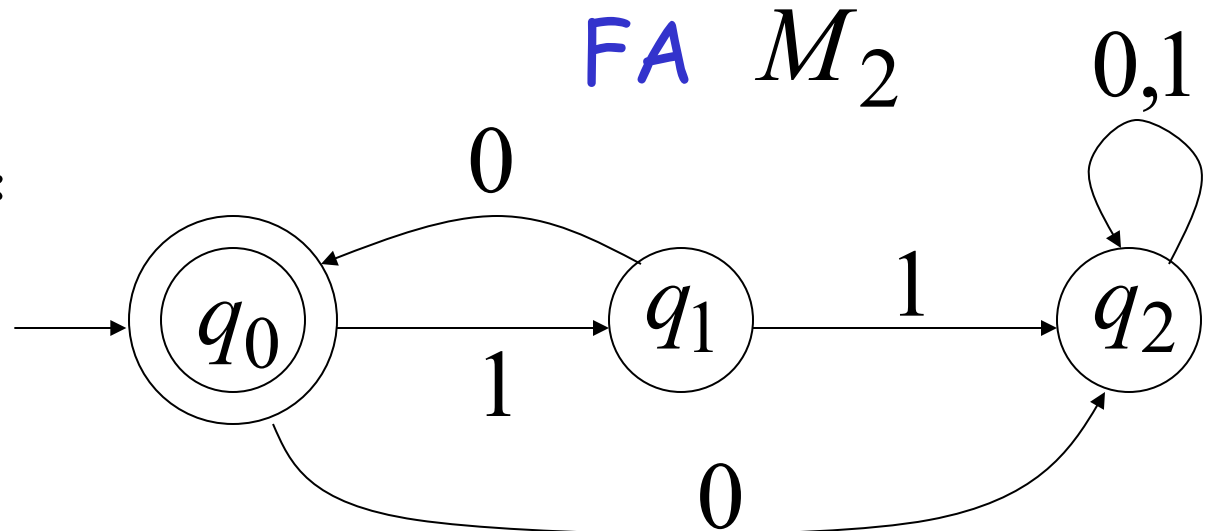


Örnek

$$L(M_1) = \{10\}^*$$



$$L(M_2) = \{10\}^*$$



$$\left\{ \begin{array}{l} \text{NFA'nın} \\ \text{tanıdığı dil} \end{array} \right\} = \left\{ \begin{array}{l} \text{Regüler} \\ \text{Diller} \end{array} \right\}$$

DFA tarafından
kabul edilen Diller

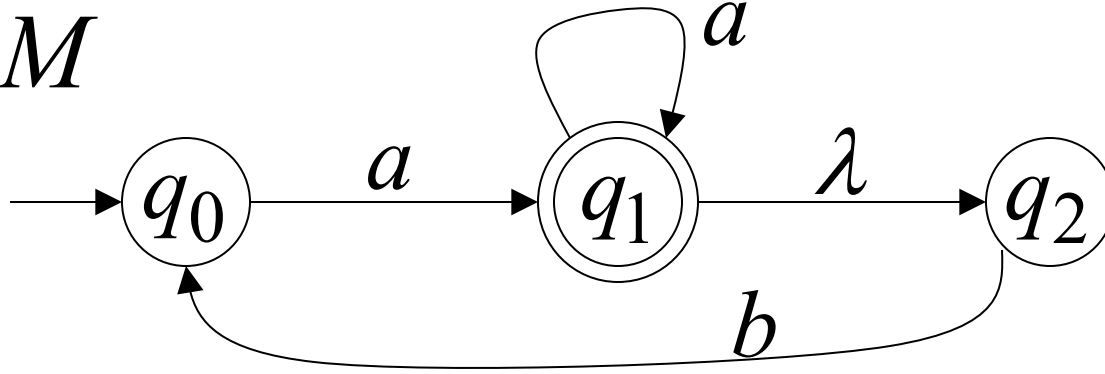
Bu yüzden NFA ve DFA aynı hesaplama gücüne sahiptir.

$$\left\{ \begin{array}{l} \text{NFA} \\ \text{tarafından} \\ \text{kabul edilen} \\ \text{diller} \end{array} \right\} \stackrel{=}{=} \left\{ \begin{array}{l} \text{Regüler} \\ \text{Diller} \end{array} \right\}$$

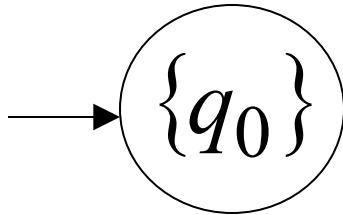
$$\left\{ \begin{array}{l} \text{NFA} \\ \text{tarafından} \\ \text{kabul edilen} \\ \text{diller} \end{array} \right\} \stackrel{=}{=} \left\{ \begin{array}{l} \text{Regüler} \\ \text{Diller} \end{array} \right\}$$

NFA'dan DFA'ya dönüşüm

NFA M

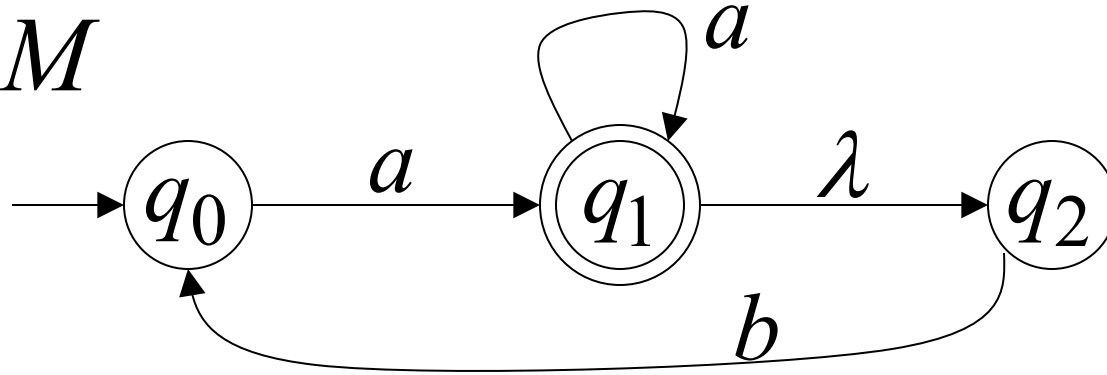


FA M'

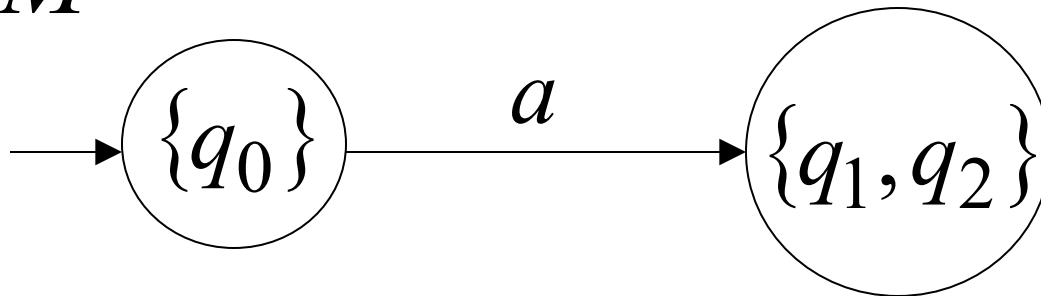


NFA'dan DFA'ya

NFA M

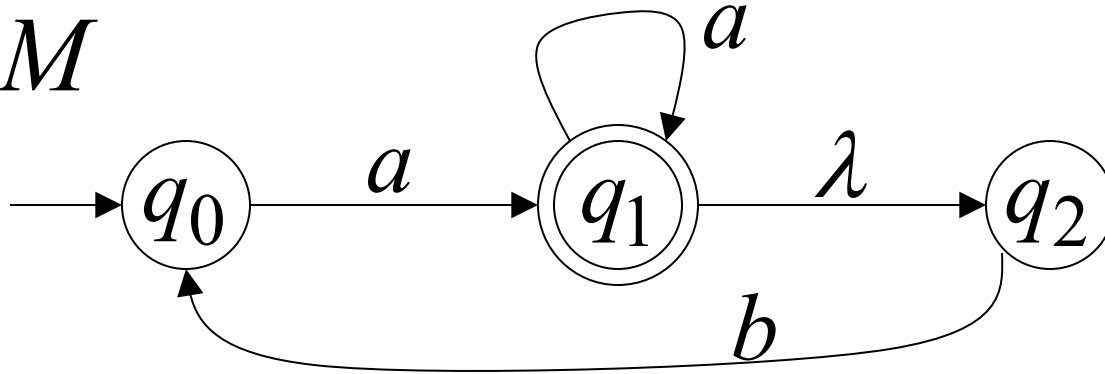


FA M'

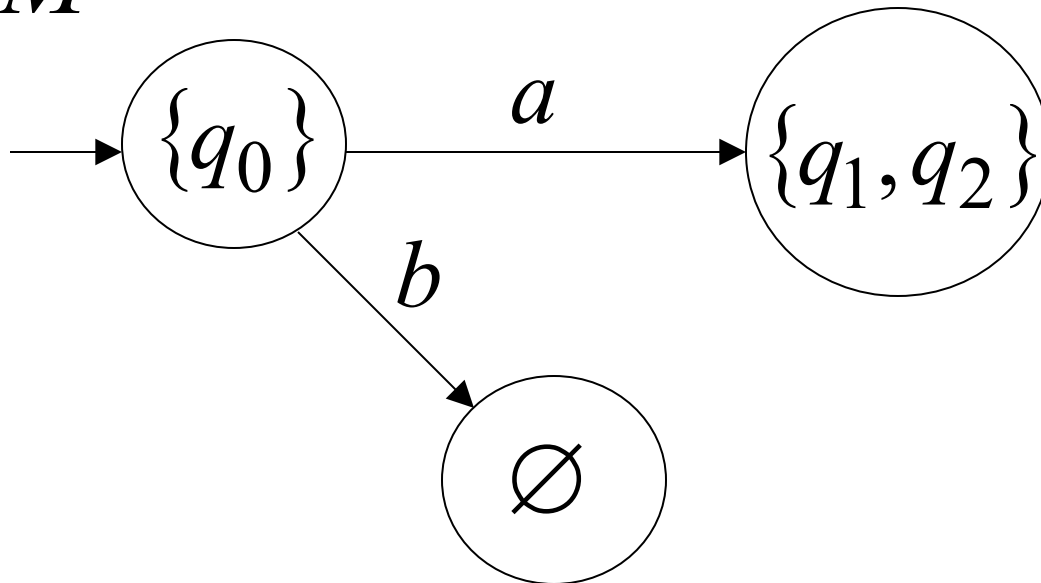


NFA'dan DFA'ya

NFA M

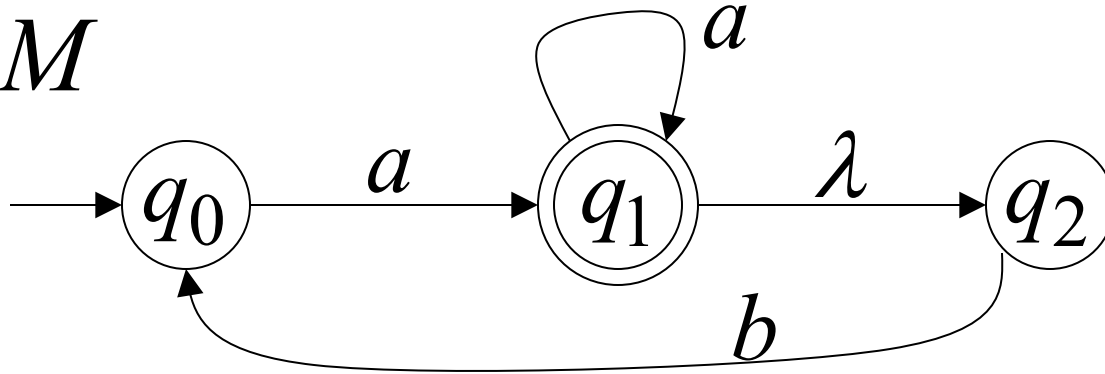


FA M'

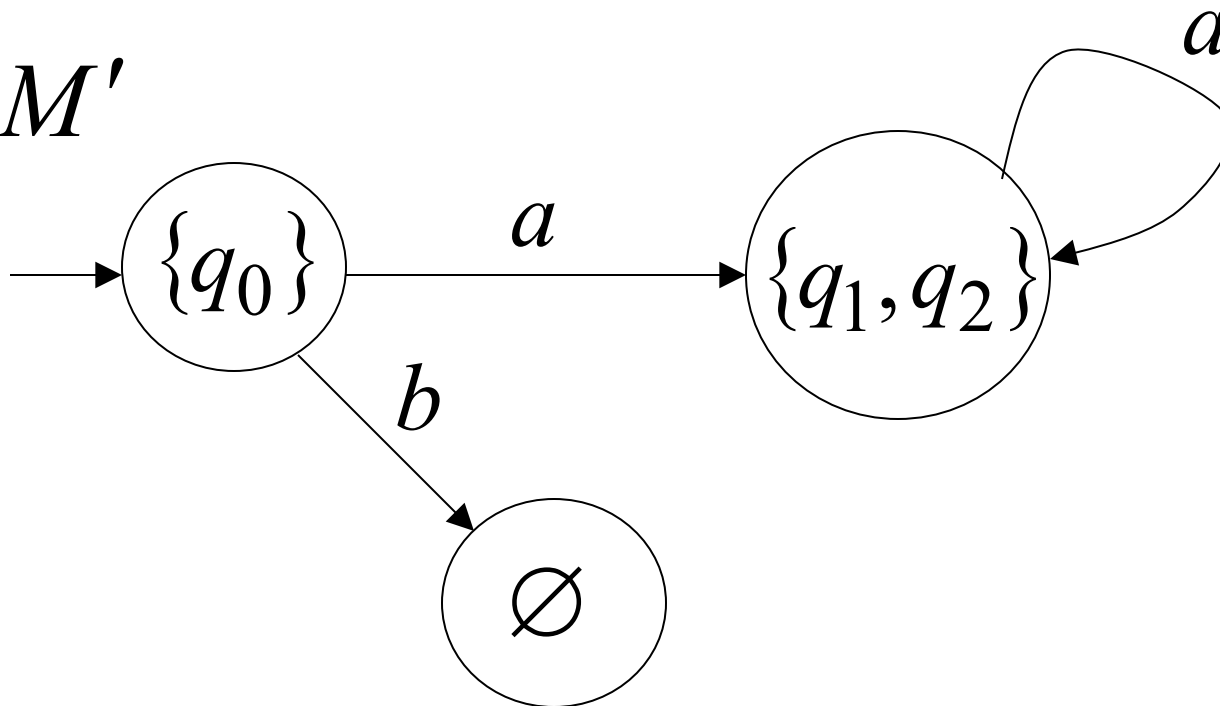


NFA'dan DFA'ya

NFA M

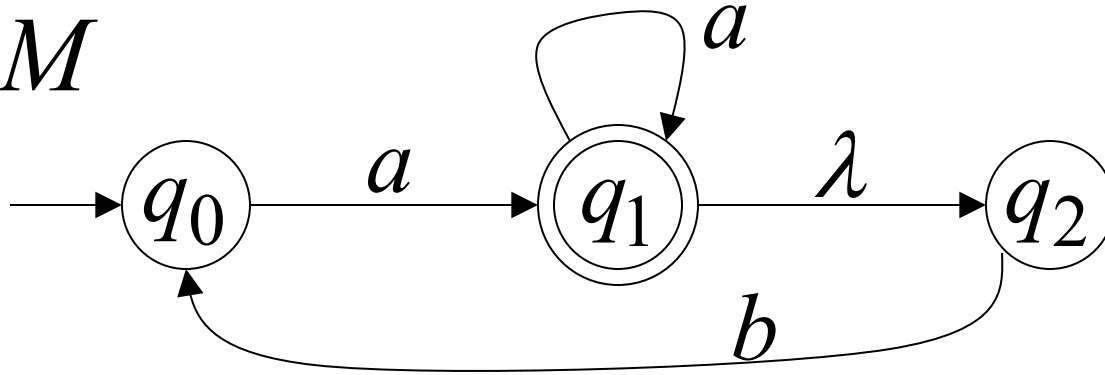


FA M'

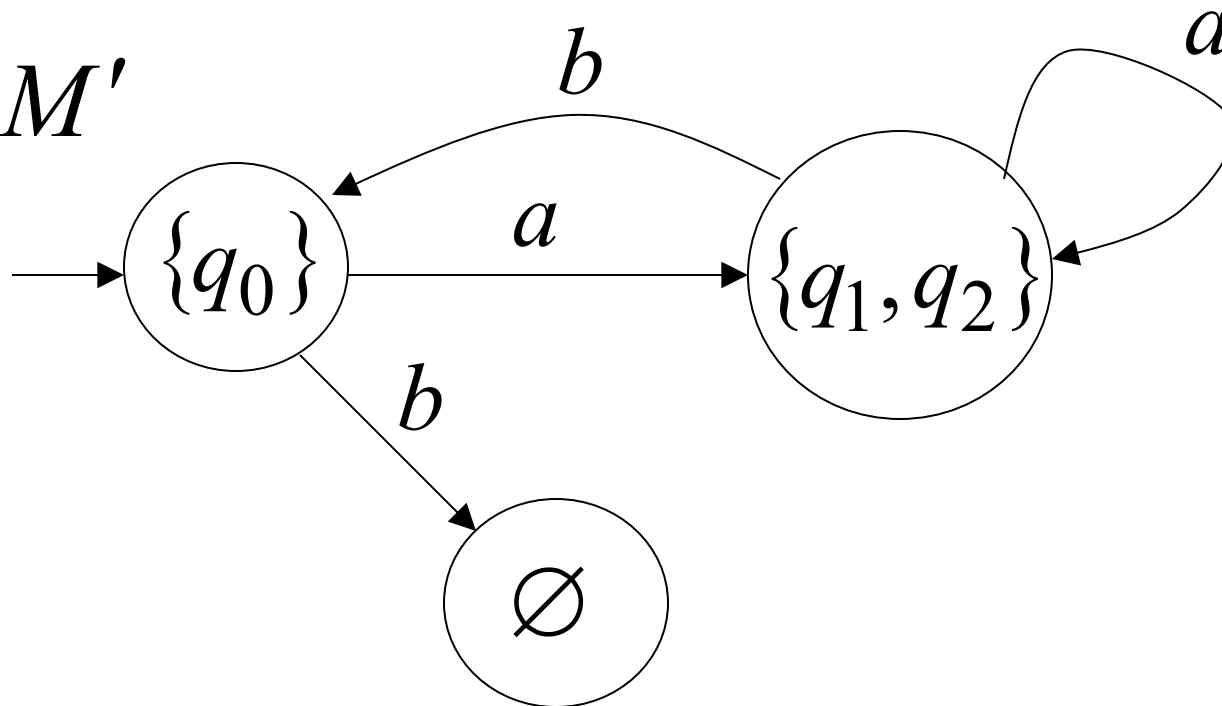


NFA'dan DFA'ya

NFA M

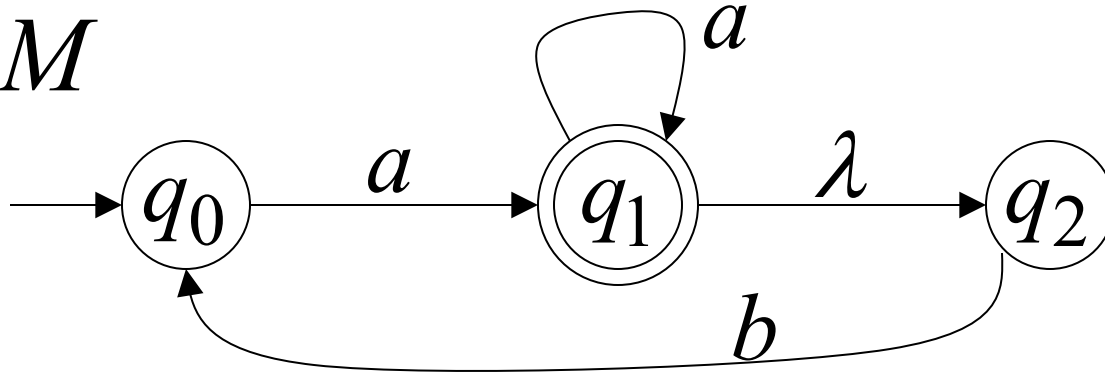


FA M'

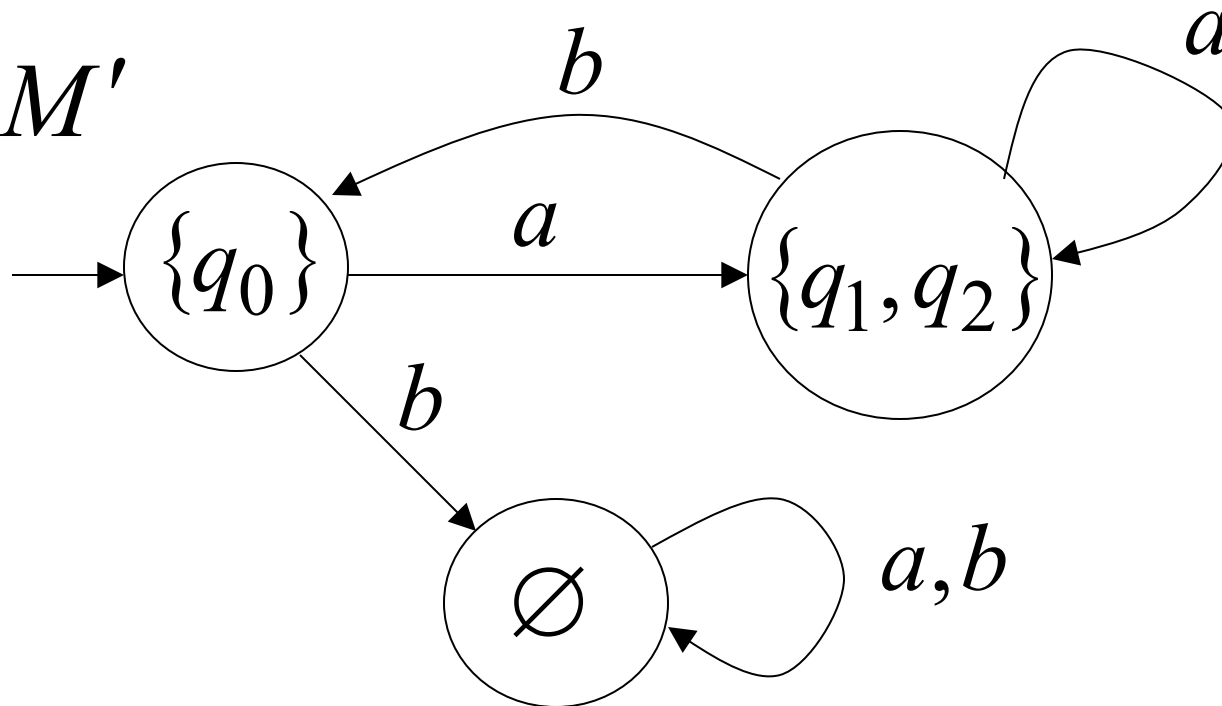


NFA'dan DFA'ya

NFA M

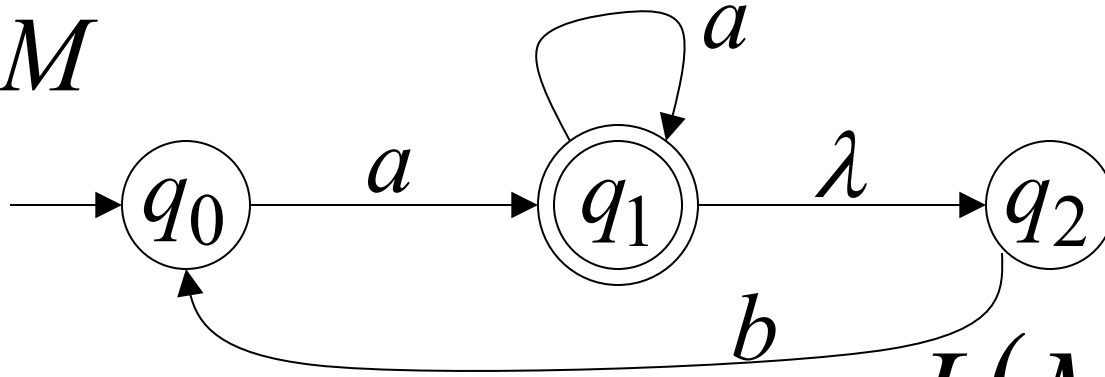


FA M'



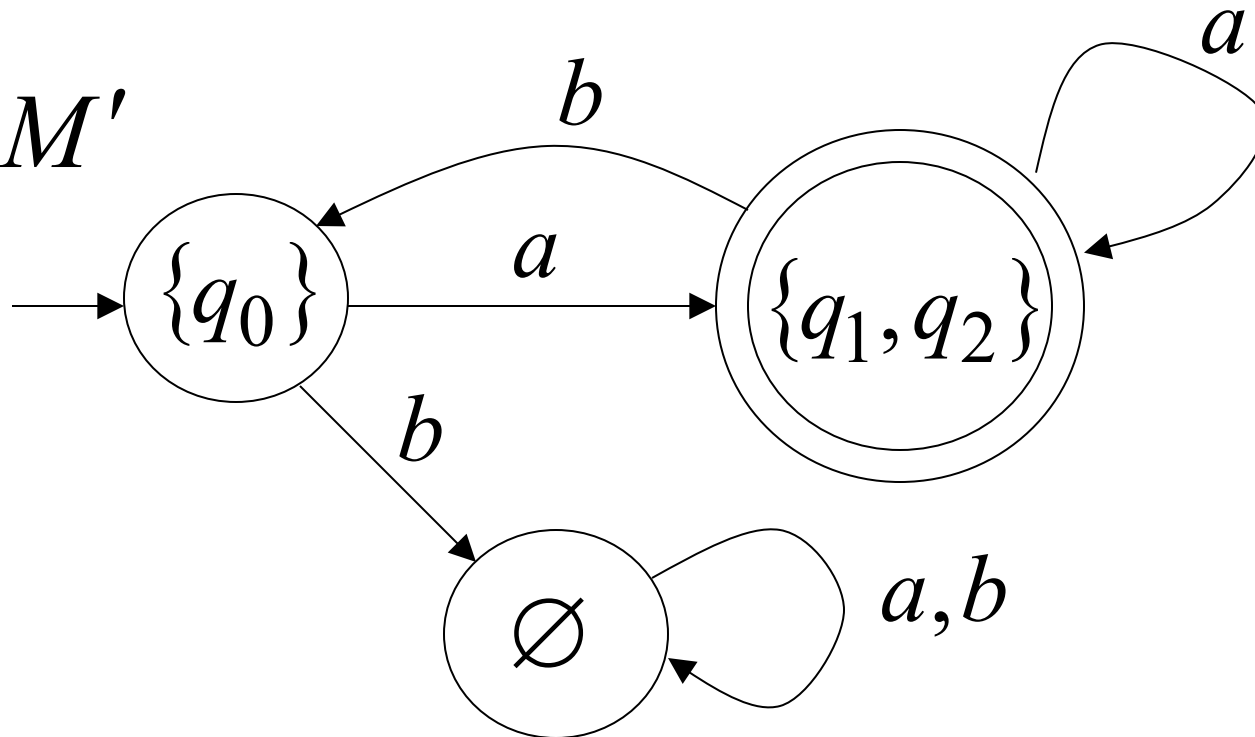
NFA'dan DFA'ya

NFA M



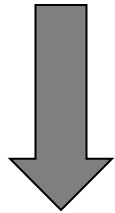
$$L(M) = L(M')$$

FA M'



NFA'dan to DFA'ya dönüşüm işlem sırası

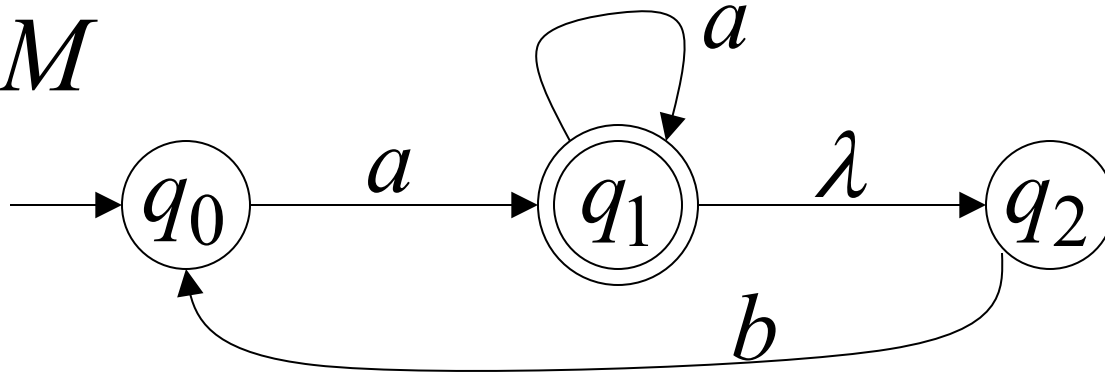
1. NFA'nın başlangıç durumu: q_0



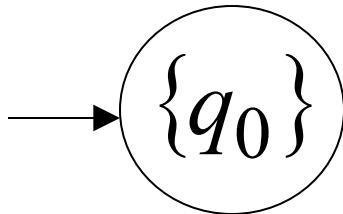
FA 'nın başlangıç durumu : $\{q_0\}$

Örnek

NFA M



FA M'



NFA'dan FA'ya

2. FA'nın her durumu için $\{q_i, q_j, \dots, q_m\}$

NFA'nın rekürsif geçiş fonksiyonu

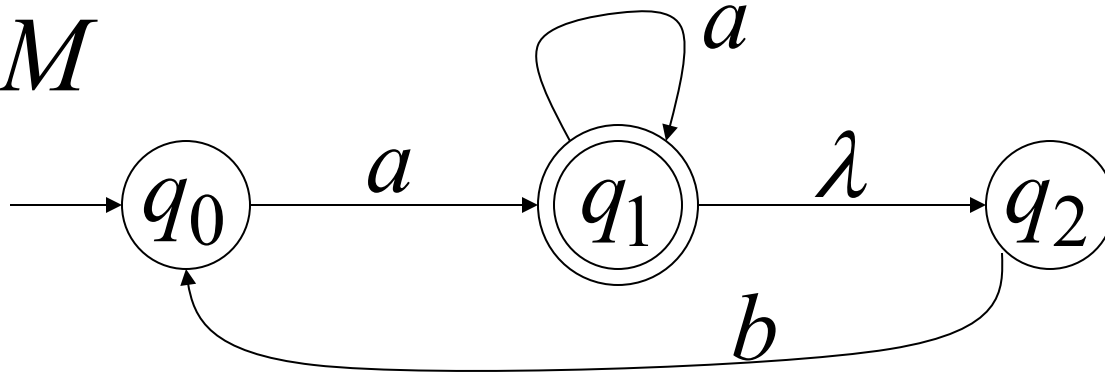
$$\left. \begin{array}{l} \delta^*(q_i, a), \\ \delta^*(q_j, a), \\ \dots \end{array} \right\} = \{q'_i, q'_j, \dots, q'_m\}$$

geçişleri FA'ya eklenir.

$$\delta(\{q_i, q_j, \dots, q_m\}, a) = \{q'_i, q'_j, \dots, q'_m\}$$

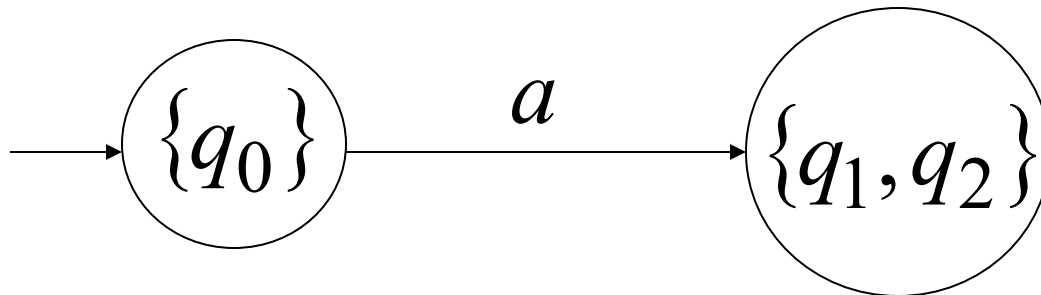
Örnek

NFA M



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

FA M'



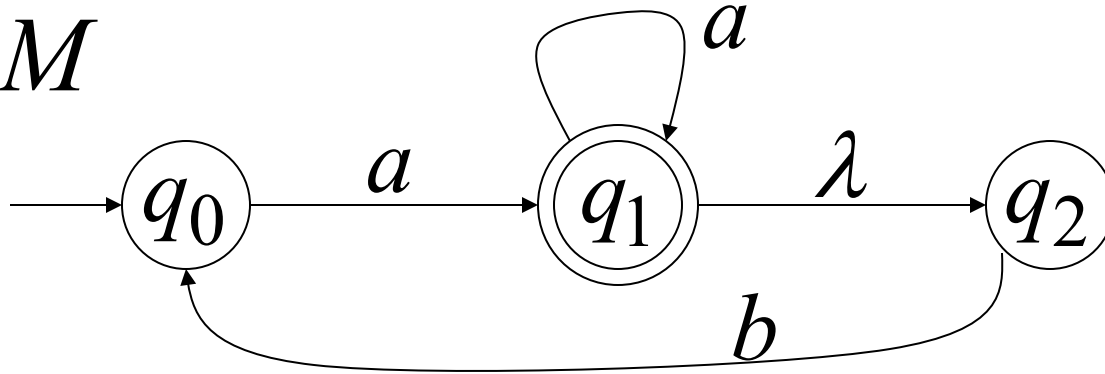
$$\delta(\{q_0\}, a) = \{q_1, q_2\}$$

NFA'dan DFA'ya

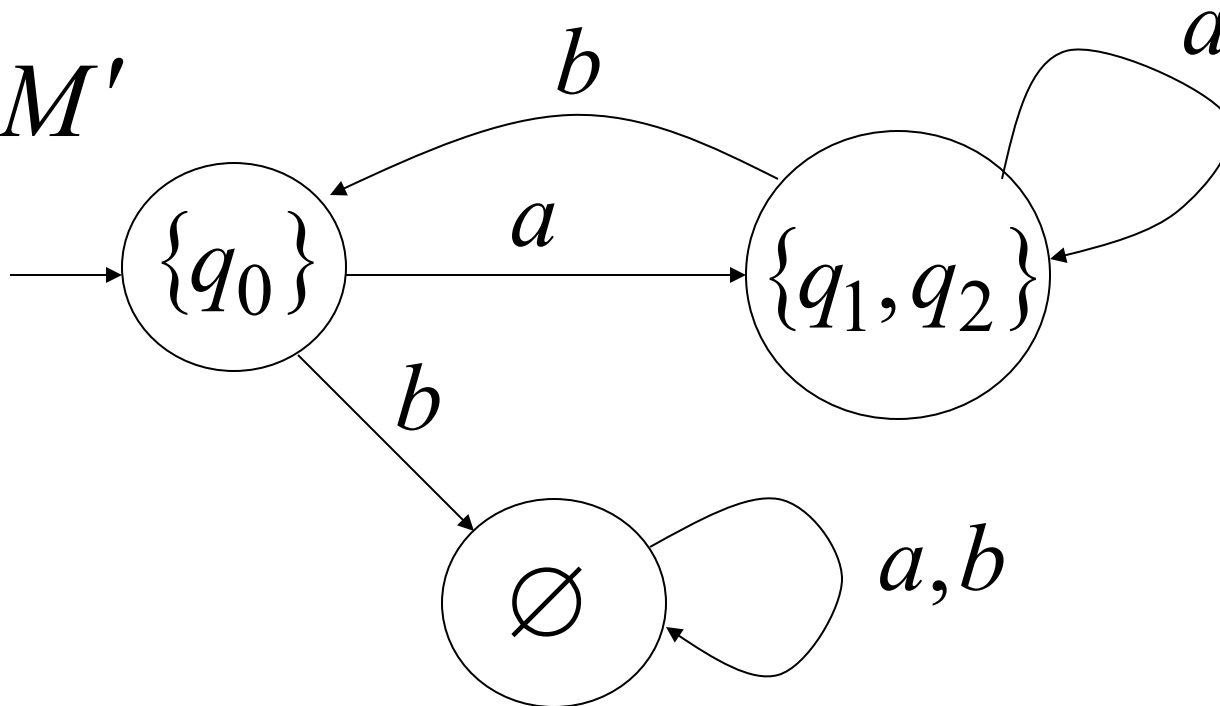
Adım 2 alfabedeki bütün geçişler (yeni geçişler eklenemeyinceye kadar) için tekrarlanır.

Örnek

NFA M



FA M'



NFA'dan DFA'ya

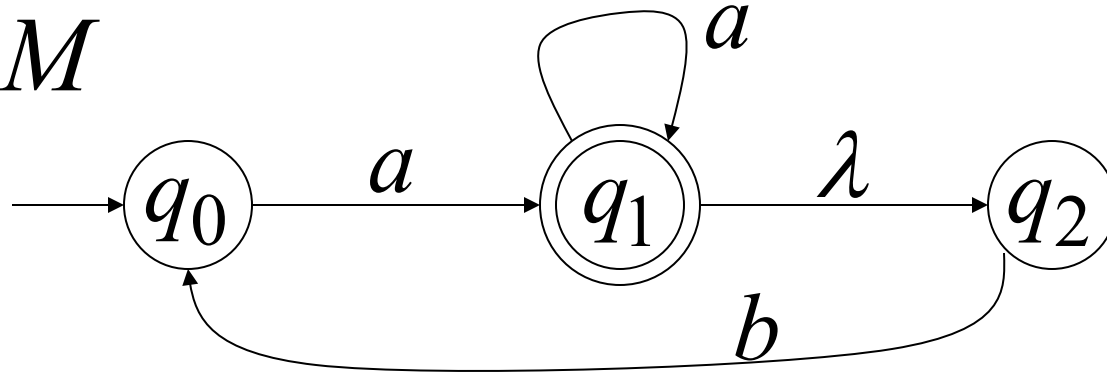
3. Herhangi bir FA durumu $\{q_i, q_j, \dots, q_m\}$

Eğer q_j NFA'da bir kabul durumu ise
FA'da kabul durumu olur.

$$\{q_i, q_j, \dots, q_m\}$$

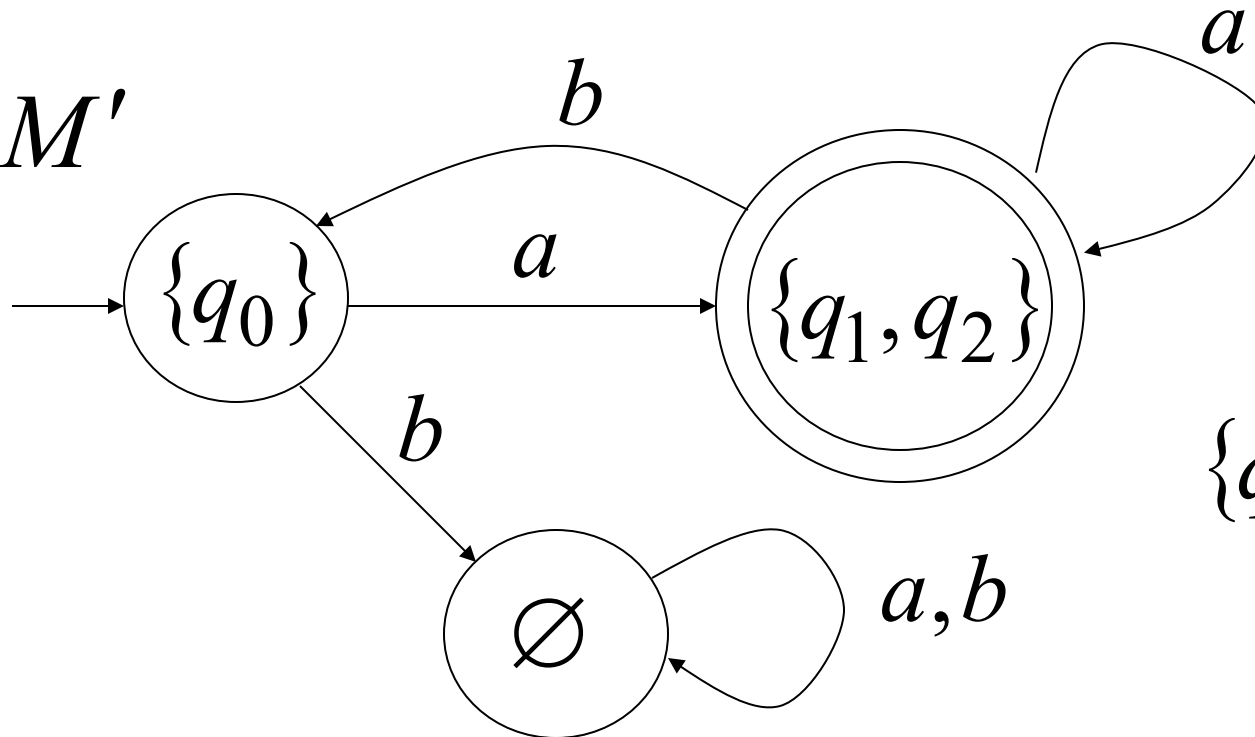
Örnek

NFA M



$q_1 \in F$

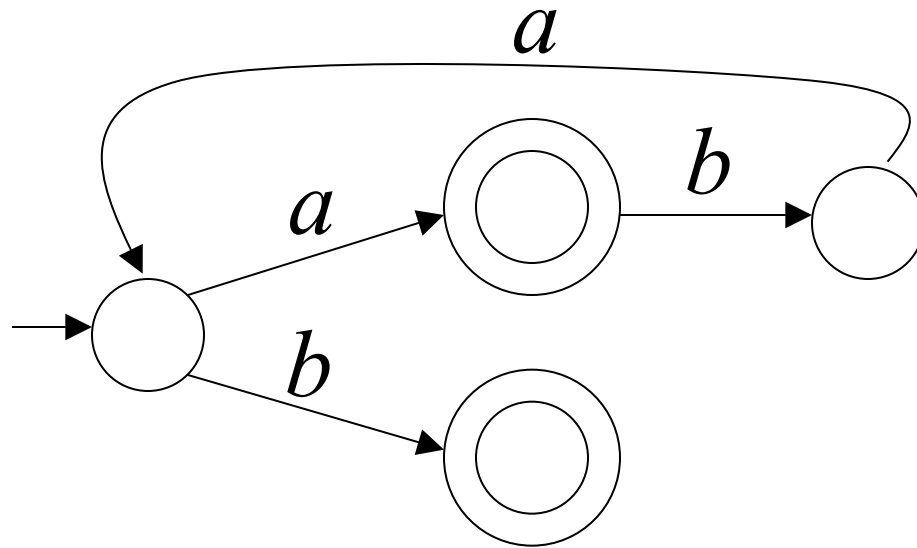
FA M'



$\{q_1, q_2\} \in F'$

Bir NFA tek kabul durumlu eşdeğer bir NFA'ya dönüştürülebilir.

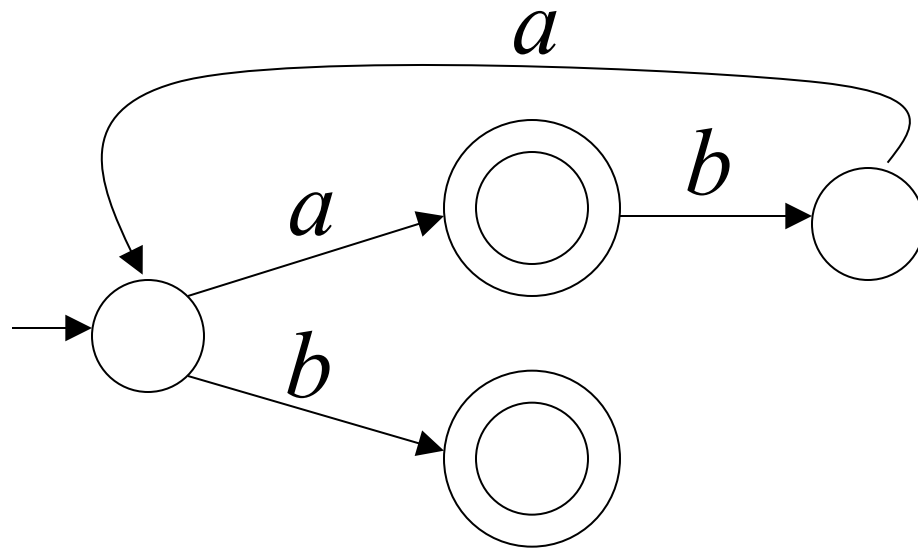
Örnek



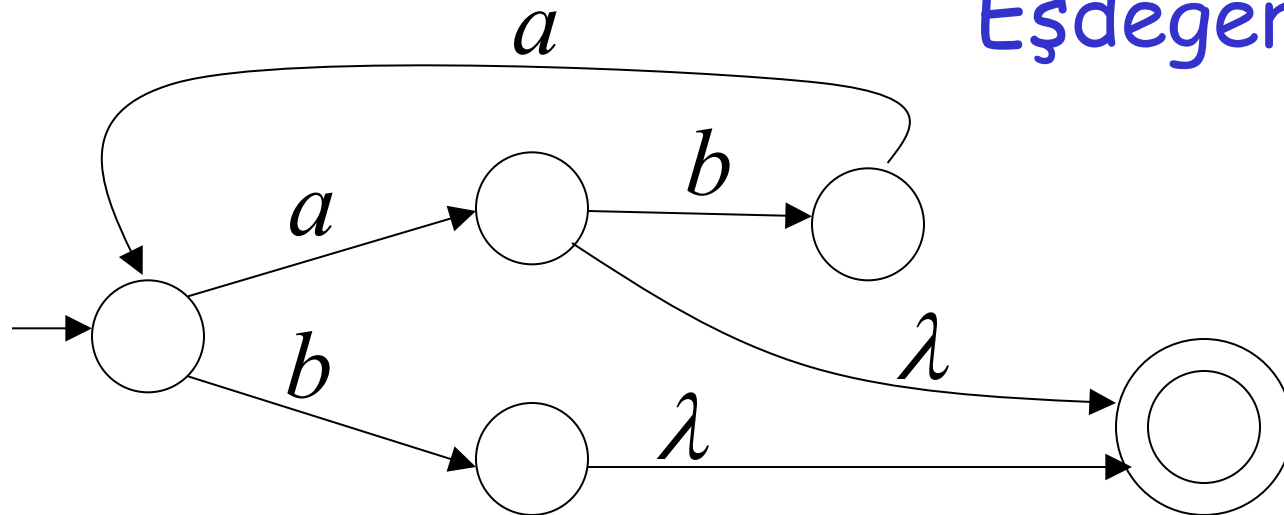
NFA

Tek kabul durumlu
eşdeğer NFA?

Örnek



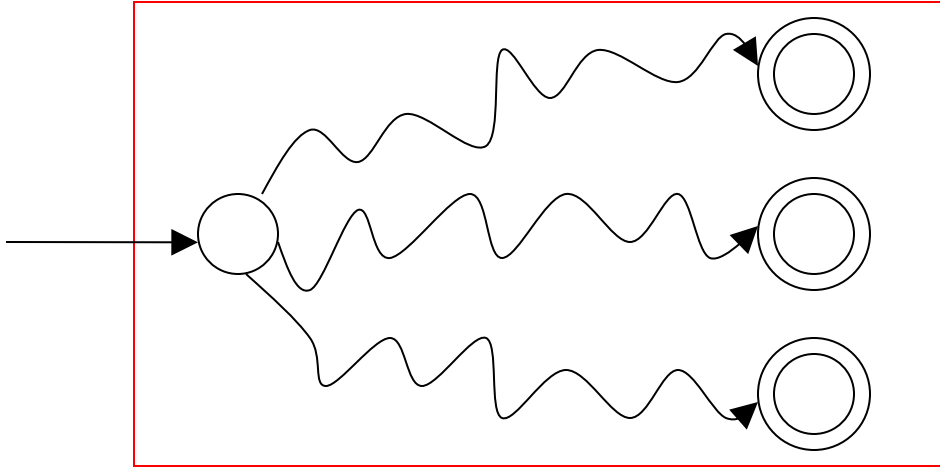
NFA



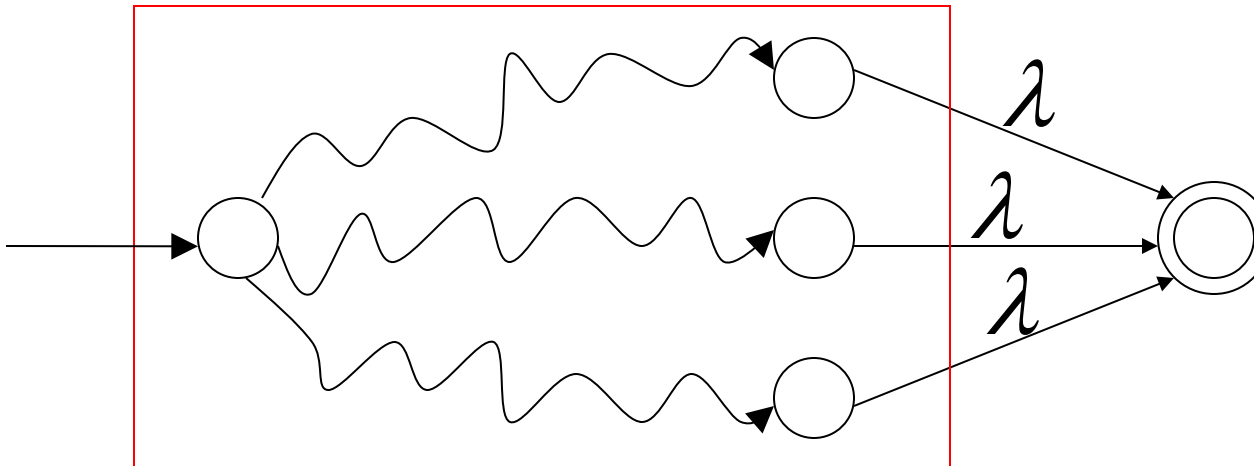
Eşdeğer NFA

Genelleme

NFA



Eşdeğer NFA



Tek kabul
durumlu