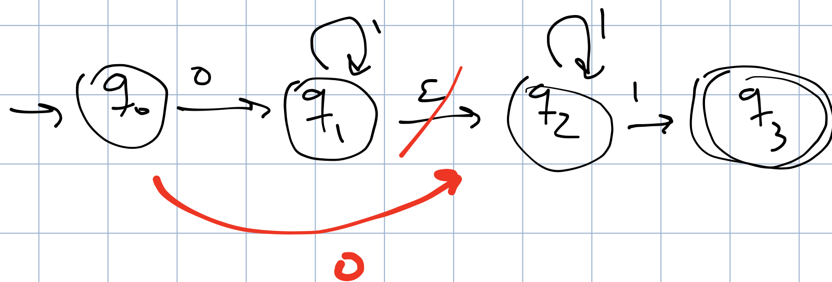
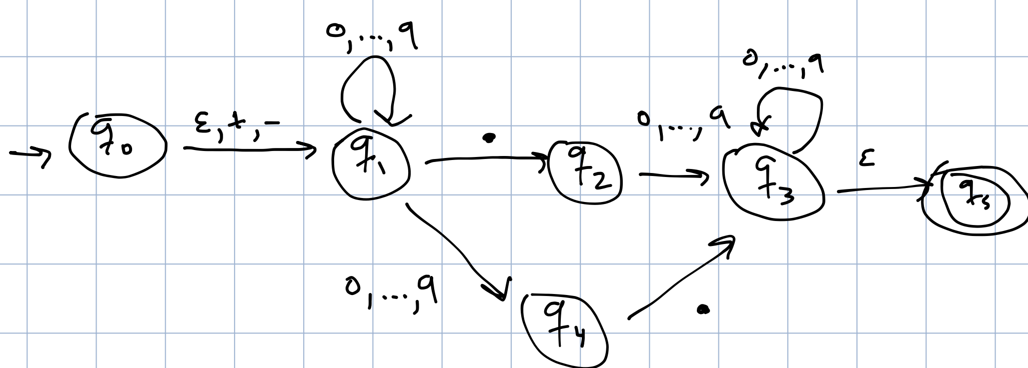
ε-AFN

• ε símbolo vacío

$$E = (Q, \Sigma, \delta, q_0, F)$$

$$\delta : Q \times \Sigma \cup \{\varepsilon\} \longrightarrow 2^Q$$





Clausura con respecto a ε

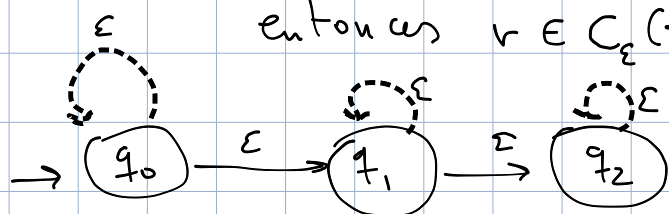
$C_\varepsilon(q)$ ~ todas transiciones
que salen de q
y están etiquetadas

con ε y de los estados siguientes que tengan ε

formalmente $C_\varepsilon(q)$

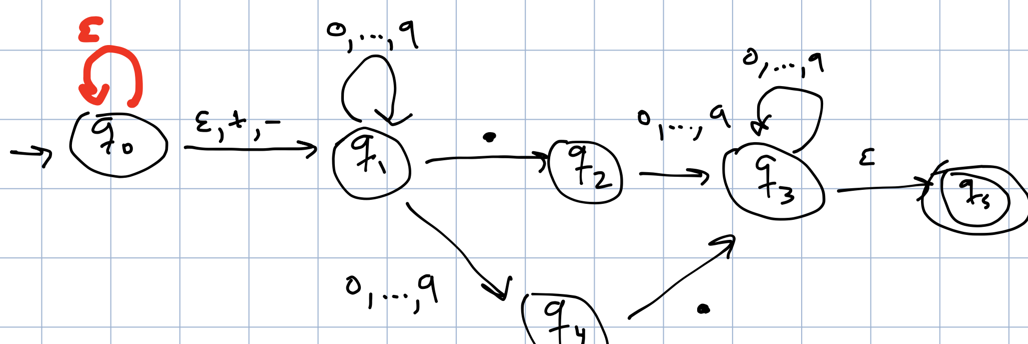
- Base: $q \in C_\varepsilon(q)$

- Inductivo: si $p \in C_\varepsilon(q)$ y $\exists\, \delta(p, \varepsilon) = r$ entonces $r \in C_\varepsilon(q)$



$$C_\varepsilon(q_0) = \{\underbrace{q_0\,,\, q_1\,,\, q_2}_{q\,,\ p\,,\ r}\}$$

Ej:



$C_\varepsilon(q_0) = \{q_0, q_1\}$ $\qquad$ $C_\varepsilon(q_3) = \{q_3, q_5\}$

$C_\varepsilon(q_1) = \{q_1\}$

Función Extendida $\hat{\delta}$

Base: $\hat{\delta}(q, \varepsilon) = C_\varepsilon(q)$

inductivo: $w = xa$ ← símbolo final

$a \neq \varepsilon$

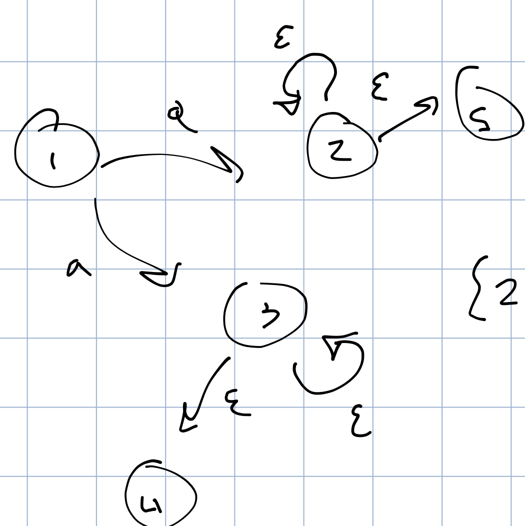
$\hat{\delta}(q, w)$

1. $\{p_1, \dots, p_k\} = \delta(q, x)$

2. $\bigcup_{i=1}^{k} \delta(p_i, a) = \{r_1, \dots, r_m\}$

3. $\hat{\delta}(q, w) = \bigcup_{i=1}^{m} C_\varepsilon(r_i)$

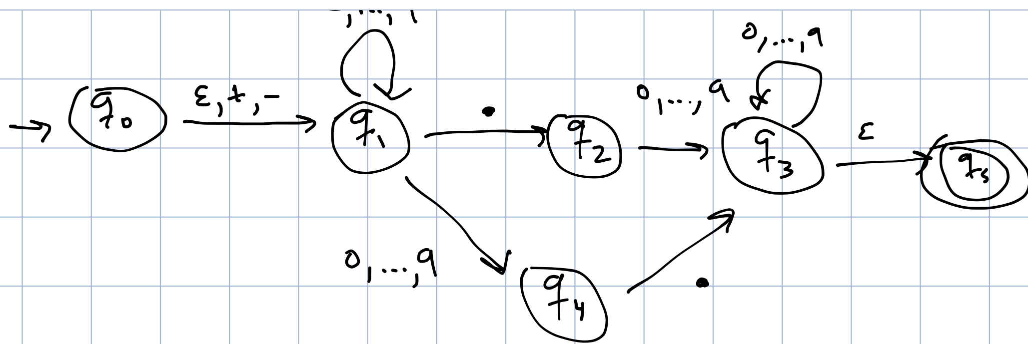
*



$\{2, 3, 4, 5\}$

Ej: "5.6"

0 ... 9



- $\hat{\delta}(q_0, \varepsilon) = C_\varepsilon(q_0) = \{q_0, q_1\}$
- $\hat{\delta}(q_0, 5)$

1. estamos en $\{q_0, q_1\}$

$$\delta(q_0, 5) \cup \delta(q_1, 5) = \{q_1, q_4\}$$

2. estamos en $\{q_1, q_4\}$

✓ $$C_\varepsilon(q_1) \cup C_\varepsilon(q_4) = \{q_1, q_4\}$$

$\hat{\delta}(q_0, 5.)$

1. estamos en $\{q_1, q_4\}$

$$\delta(q_1, .) \cup \delta(q_4, .) = \{q_2, q_3\}$$

2. Clausuras

$$C_\varepsilon(q_2) \cup C_\varepsilon(q_3) = \{q_2, q_3, q_5\}$$

$C_\varepsilon(q_2) \cup C_\varepsilon(q_3) = \{q_2, q_3, q_5\}$

- $\hat{\delta}(q_0, 5.6)$

1. $\delta(q_2, 6) \cup \delta(q_3, 6) \cup \delta(q_5, 6)$
$= \{q_3\}$

2. clausuras
$\hat{\delta}(q_0, 5.6) = C_\varepsilon(q_3) = \{q_3, q_5\}$ ✓

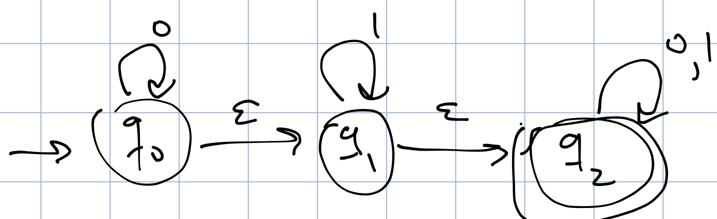
Lenguaje:

$E = AFN - \varepsilon$

$L(E) = \{w \mid \hat{\delta}(q_0, w) \cap F \neq \emptyset\}$

Eliminacion de transiciones ε

Ej:



	0	1
q_0	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
q_1	$\{q_2\}$	$\{q_1, q_2\}$
q_2	$\{q_2\}$	$\{q_2\}$

q_2 | $\{q_2\}$ $\{q_2\}$

$\delta(q_0, 0)$

1. Clausuras

$C_\varepsilon(q_0) = \underline{\{q_0, q_1, q_2\}}$

2. $\delta(q_0, 0) \cup \delta(q_1, 0) \cup \delta(q_2, 0)$

$= \{q_0, q_2\}$

3. Clausura

$C_\varepsilon(q_0) \cup C_\varepsilon(q_2) = \{q_0, q_1, q_2\}$

$\delta(q_0, 1)$

1. $C_\varepsilon(q_0) = \{q_0, q_1, q_2\}$

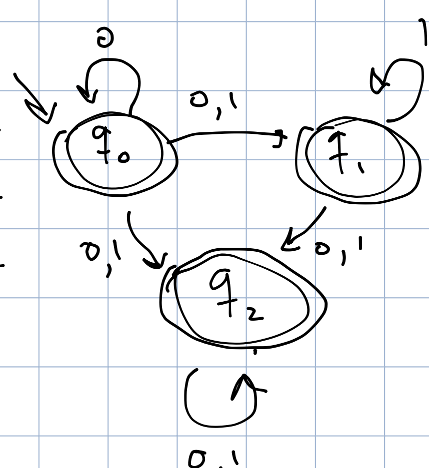
2. $\delta(q_0, 1) \cup \delta(q_1, 1) \cup \delta(q_2, 1)$

$= \emptyset \cup \{q_1\} \cup \{q_2\} = \{q_1, q_2\}$

3. $C_\varepsilon(q_1) \cup C_\varepsilon(q_2)$

$\{q_1, q_2\}$

	0	1	
$\rightarrow q_0$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$	$\in F$
q_1	$\{q_2\}$	$\{q_1, q_2\}$	$\in F$
q_2	$\{q_2\}$	$\{q_2\}$	$\in F$



$$\text{AFN-}\varepsilon \longleftrightarrow \text{AFN} \longleftrightarrow \text{AFD}$$

$$L(E) = L(N) = L(D)$$