automi deterministici: automi non deterministici:
DFA deterministico
Q
Σ
δ
q
a
$\delta(q, a)$
p
q
q
p^2
Q
F
F
Q
$A = (Q, \Sigma, \delta, q_0, F)$

A
Q
Σ
δ
q_0
F
$a_1...a_n$
q_0
δ
$\delta(q_0, a_1) =$
q_1
a_1
$\delta(q_1, a_2) =$
q_2
$\delta(q_{i-1}, a_i) =$
q_i
q_n
q_n
F
$a_1...a_n$
$L = \{w|w\} = \{01, 11010, 100011, ...\}$

$L = \{x01y|x, y \in \{0, 1\}^*\}$

$\Sigma = \{0, 1\}$

A
q_0
q_0
$\delta(q_0, 1) =$
q_0
q_2
$\delta(q_0, 0) =$
q_2
q_2
q_2
$\delta(q_2, 0) =$
q_2
q_1
$\delta(q_2, 1) =$
q_1
$\delta(q_1, 0) =$
$\delta(q_1, 1) =$
q_1
$Q = \{q_0, q_1, q_2\} F = \{q_1\}$

$A = \{\{q_0, q_1, q_2\}, \{0, 1\}, \delta, q_0, \{q_1\}\}$

$\delta(q_0, 1) = q_0$

$\delta(q_0, 0) = q_2$

$\delta(q_2, 0) = q_2$

$\delta(q_2, 1) = q_1$

$\delta(q_1, 0) = q_1$

$\delta(q_1, 1) = q_1$

$\rightarrow$
$*$
$\rightarrow \delta$ $q_0 q_1 q_0$
$*q_1$ $q_1 q_1$
q_2 $q_2 q_1$
$0)_0$

$L = \{w \in \{a,b\}^* | \}$

$_0)_0$
$_1)[right =$
$of q_0]_1$
$_0)edge[bendleft =$
$25]node b(q_1)edge[loopbelow]node a()(q_1)edge[bendleft =$
$25]node b(q_0)edge[loopbelow]node a();$
q_0
q_1
b
q_0
a
$L = \{w \in \{a,b\}^* | \}$

$_0)_0$
$_1)[right =$
$of q_0]_1$
$_0)edge[bendleft =$
$25]node b(q_1)edge[loopbelow]node a()(q_1)edge[bendleft =$
$25]node b(q_0)edge[loopbelow]node a();$
q_0
q_1
b
q_1
a
q_1
q_0
b
$L = \{w \in \{0,1\}^* | w = 0^n 1^m\}$

Si
ha
che
q_E
è
lo
stato
pozzo
dove
vanno
le
stringhe
venute
male
$n, m \geq$
0
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_E)[right =$
$of q_1]_E$
$_0)edge node 1(q_1)edge[loopbelow]node 0()(q_1)edge node(q_E)edge[loopbelow]node 1()(q_E)edge[loopbelow]node 0, 1();$
q_0
q_1
$n \geq$
0 $m >$
0
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_E)[right =$
$of q_1]_E$
$_0)edge node 1(q_1)edge[loopbelow]node 0()(q_1)edge node(q_E)edge[loopbelow]node 1()(q_E)edge[loopbelow]node 0, 1();$
q_0
$n >$
0 $m \geq$
0
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_2)[right =$
$of q_1]_2$
$_E)[right =$
$of q_2]_E$
$_0)edge node 0(q_1)edge[bendright]node 1(q_E)(q_1)edge node 1(q_2)edge[loopabove]node 0()(q_2)edge node 0(q_E)edge[loopabove]no$
CHIARIRE
$n, m >$
0
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_2)[right =$
$of q_1]_2$
$_E)[right =$
$of q_2]_E$
$_0)edge node 0(q_1)edge[bendright]node 1(q_E)(q_1)edge node 1(q_2)edge[loopabove]node 0()(q_2)edge node 0(q_E)edge[loopabove]no$
CHIARIRE

$L = \{w \in \{a,b\}^* | \}$

$_0)_{pp}$
$_1)[right =$
$of q_0]_{dp}$
$_2)[below =$
$of q_0]_{pd}$
$_3)[right =$
$of q_2]_{dd}$
$_0)edge[bendleft =$
$25]node a(q_1) edge[bendright =$
$25]node[left] b(q_2) (q_1) edge[bendleft =$
$25]node a(q_0) edge[bendright =$
$25]node[left] b(q_3) (q_2) edge[bendright =$
$25]node[right] b(q_0) edge[bendleft =$
$25]node a(q_3) (q_3) edge[bendright =$
$25]node[right] b(q_1) edge[bendleft =$
$25]node a(q_2);$
$L = \{w \in \{a,b\}^* | \}$

$L = \{a^{2n} b^{2k+1} | j,k \geq 0\}$

$_0)_0$
$_1)[right =$
$of q_0]_1$
$_2)[below =$
$of q_0]_2$
$_3)[right =$
$of q_2]_3$
$_4)[right =$
$of q_3]_E$
$_0)edge[bendleft =$
$25]node b(q_1) edge[bendright =$
$25]node[left] a(q_2) (q_1) edge[bendleft =$
$25]node a(q_4) edge[bendright =$
$25]node[left] b(q_3) (q_2) edge[bendright =$
$25]node[below] b(q_4) edge[bendright =$
$25]node[right] a(q_0) (q_3) edge[bendright =$
$25]node[right] b(q_1) edge[bendleft =$
$25]node a(q_4);$
$\overset{\delta}{\rightarrow}$
$q_0\ q_1\ q_2$
$q_1 \quad q_0\ q_E$
$*q_2 \quad q_E\ q_3$
$q_3 \quad q_E\ q_2$
$q_E \quad q_E q_E$
$L = \{a^{2k+1} b^{2h} | \, h,k \geq 0\}$

$_0)_0$
$_1)[right =$
$of q_0]_1$
$_3)[right =$
$of q_1]_3$
$_2)[below =$
$of q_1]_2$
$_4)[right =$
$of q_2]_4$
$_5)[right =$
$of q_4]_E$
$_0)edgenode[bendleft =$
$25]a(q_1) (q_1) edge[bendleft =$
$25]node a(q_2) edgenode[bendleft =$
$25]b(q_3) (q_2) edge[bendleft =$
$25]node[left] a(q_1) (q_3) edge[bendright =$
$25]node[left] b(q_4) (q_4) edge[bendright =$
$25]node(q_3);$
$L = \{a^{2n+1} b^{2k+1} | \, n,k \geq 0\}$

$_0)_0$
$_1)[right =$
$of q_0]_1$
$_3)[right =$
$of q_1]_3$
$_2)[below =$
$of q_1]_2$
$_4)[right =$
$of q_2]_4$
$_5)[right =$
$of q_4]_E$
$_0)edgenode[bendleft =$

$_0$); $[state, accepting](q_1)[right =$
$of q_0]$; $[state, accepting](q_2)[below =$
$of q_0]$; $[state](q_3)[right =$
$of q_2]$; $[->$
$](q_0)edgenodeb(q_1)edgenodec(q_2)edge[loopabove]nodea()(q_1)edgenodec(q_2)edgenodea(q_3)edge[loopabove]nodeb()(q_2)edgen$
$_0)\{_0, q_1, q_2\}$
$_1)[right =$
$of q_0]\{_1, q_2\}$
$_2)[below =$
$of q_0]\{_2\}$
$_3)[right =$
$of q_2]_E$
$_0)edgenodeb(q_1)edgenodec(q_2)edge[loopabove]nodea()(q_1)edgenodec(q_2)edgenodea(q_3)edge[loopabove]nodeb()(q_2)edgenod$

$w =$
$x0\overline{10}y,\ x, y \in$
$\{0, 1\}^*$
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_2)[right =$
$of q_1]_2$
$_3)[right =$
$of q_2]_3$
$_0)edgenode0(q_1)edge[loopabove]node1()(q_1)edgenode1(q_2)edge[loopabove]node0()(q_2)edgenode0(q_3)edge[bendleft =$
$45]node1(q_0)(q_3)edge[loopabove]node0, 1();$
$a^{2k+1}b^{2h},\ h, k \geq$
0
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_3)[right =$
$of q_1]_3$
$_2)[below =$
$of q_1]_2$
$_4)[right =$
$of q_2]_4$
$_5)[right =$
$of q_4]_E$
$_0)edgenode[bendleft =$
$25]a(q_1)(q_1)edge[bendleft =$
$25]nodea(q_2)edgenode[bendleft =$
$25]b(q_3)(q_2)edge[bendleft =$
$25]node[left]a(q_1)(q_3)edge[bendright =$
$25]node[left]b(q_4)(q_4)edge[bendright =$
$25]node[right]b(q_3)(q_2)edge[bendright =$
$55]node[below]b(q_5)(q_3)edge[bendleft =$
$25]nodea(q_5)(q_4)edge[bendright =$
$25]node[below]a(q_5)(q_5)edge[loopright]nodea, b();$
$abbcb$
$_0)_0$
$_1)[right =$
$of q_0]_1$
$_2)[right =$
$of q_1]_2$
$_3)[right =$
$of q_3]_3$
$_5)[below =$
$of q_0]_E$
$_0)edgenode[bendleft =$
$25]a(q_1)edgenode[bendleft =$
$25]b, c(q_5)(q_1)edgenodeb(q_2)edge[loop]nodea, c()(q_2)edge[bendleft =$
$25]nodea, c(q_1)edgenodeb(q_3)(q_3)edge[bendleft =$
$65]node[below]b(q_5)edge[bendleft =$
$55]nodea, c(q_1)(q_5)edge[loopleft]nodea, b, c();$

$_{0})_{0}$
$_{1})[right =$
$of q_0]_1$
$_{2})[right =$
$of q_1]_2$
$_{e})[right =$
$of q_2]_E$
$_{0})edge[bendleft =$
$25]node0(q_1)edge[loop]node1()(q_1)edgenode0(q_2)edge[bendleft =$
$25]node1(q_0)(q_2)edgenode0(q_e)edge[bendleft =$
$55]node1(q_0)(q_e)edge[loop]node0,1();$
$_{0})_{0}$
$_{1})[right =$
$of q_0]_1$
$_{2})[right =$
$of q_1]_2$
$_{e})[right =$
$of q_2]_E$
$_{0})edge[bendleft =$
$25]node0(q_1)edge[loop]node1()(q_1)edgenode0(q_2)edge[bendleft =$
$25]node1(q_0)(q_2)edgenode0(q_e)edge[bendleft =$
$55]node1(q_0)(q_e)edge[loop]node0,1();$
$_{0})_{0}$
$_{1})[right =$
$of q_0]_1$
$_{2})[right =$
$of q_1]_2$
$_{3})[right =$
$of q_2]_3$
$_{4})[below =$
$of q_3]_3$
$_{5})[below =$
$of q_4]_5$
$_{6})[below =$
$of q_5]_6$
$_{e})[right =$
$of q_3]_E$
$_{0})edge[bendleft =$
$25]node0(q_1)edge[loop]node1()(q_1)edgenode0(q_2)edge[bendleft =$
$25]node1(q_0)(q_2)edgenode0(q_3)edge[bendleft =$
$45]node1(q_0)(q_3)edgenode0(q_e)edgenode1(q_4)(q_4)edge[bendleft =$
$25]node0(q_5)edge[loopright]node1()(q_5)edge[bendleft =$
$25]node1(q_4)edgenode0(q_6)(q_6)edge[bendright =$
$25]node0(q_e)edge[bendleft =$
$55]node0(q_4)(q_e)edge[loop]node0,1();$

$_0)_0$
$_1)[aboveright =$
$of q_0]_1$
$_2)[belowright =$
$of q_0]_2$
$_3)[belowright =$
$of q_1]_3$
$_0)edge[bendleft =$
$25]nodea(q_1)edge[bendright =$
$25]node[below]b(q_2)(q_1)edge[bendleft =$
$25]nodea(q_2)edge[loop]nodea()(q_2)edge[bendleft =$
$25]nodeb(q_1)edge[bendright =$
$15]node[below]b(q_3)(q_3)edgenode[above]a(q_1)edge[bendright =$
$15]node[above]a(q_2);$

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

$\delta_D(\{q_0\}, b) = \delta_N(q_1, b) = \emptyset$

$\delta_D(\{q_1, q_2\}, a) = \delta_N(q_1, a) \cup \delta_N(q_2, a) = \{q_1, q_2\} cup \emptyset = \{q_1, q_2\}$

$\delta_D(\{q_1, q_2\}, b) = \delta_N(q_1, b) \cup \delta_N(q_2, b) = \emptyset \cup \{q_1, q_3\} = \{q_1, q_3\}$

...

$*\rightarrow \{q_0\}\{q_1, q_2\} \quad \emptyset$
$*\{q_1, q_2\}\ \{q_1, q_2\}\{q_1, q_3\}$
$\quad \emptyset \qquad \emptyset \qquad \emptyset$
$*\{q_1, q_3\}\ \{q_1, q_2\} \quad \emptyset$

$A =$
$\{q_0\}$
$B =$
$\{q_1, q_2\}$
$C =$
$\emptyset$
$D =$
$\{q_1, q_3\}$

$_0); [state, accepting](q_1)[right =$
$of q_0]; [state](q_2)[below =$
$of q_0]; [state, accepting](q_3)[right =$
$of q_2]; [->$
$](q_0)edgenodea(q_1)edgenodeb(q_2)(q_1)edge[bendleft =$
$25]nodeb(q_3)edge[loop]nodea()(q_2)edge[loopbelow]nodea, b()(q_3)edge[bendleft =$
$25]nodea(q_1)edgenodea(q_2);$
ε
$_0); [state](q_1)[right =$
$of q_0]; [state, accepting](q_2)[belowright =$
$of q_0]; [->$
$](q_0)edge[bendleft =$
$25]node[left]c(q_2)edge[bendright =$
$25]nodeb(q_1)edge[loop]nodea()(q_1)edge[bendright =$
$25]node\varepsilon$
$_0)edge[bendright =$
$25]node[left]b(q_2)edge[loop]nodea()(q_2)edge[bendleft =$
$25]nodec(q_0)edge[bendright =$
$25]node[right]\varepsilon$
$_1)edge[loopbelow]nodea();$
$ECLOSE(p) = \{p\}$

$ECLOSE(q) = \{p, q\}$

$ECLOSE(r) = \{p, q, r\}$

to	$\{p\}$	$\{p\}$	$\{p, q\}$	$\{p, q, r\}$
	$\{p, q\}$	$\{p, q\}$	$\{p, q, r\}$	$\{p, q, r\}$
$*$	$\{p, q, r\}$	$\{p, q, r\}$	$\{p, q, r\}$	$\{p, q, r\}$

$\delta_D(\{p\}, a) = ECLOSE(\delta_(p, a)) = ECLOSE(\{p\}) = ECLOSE(p) = \{p\}$

$\delta_D(\{p, q\}, a) = ECLOSE(\delta_N(p, a) \cup \delta_N(q, a)) =$

$ECLOSE(\{p\} \cup \{q\}) = ECLOSE(P) \cup ECLOSE(q) = \{p\} \cup \{p, q\} = \{p, q\}$

...

$A =$
$\{p\}$
$b =$
$\{p, q\}$
$C =$
$\{p, q, r\}$
$_0); [state](q_1)[right =$
$of q_0]; [state, accepting](q_2)[below =$
$of q_0]; [->$
$](q_0)edgenodeb(q_1)edgenodec(q_2)edge[loop]nodea()(q_1)edgenodeb, c(q_3)edge[loop]nodea()(q_2)edge[loopbelow]nodea, b, c();$