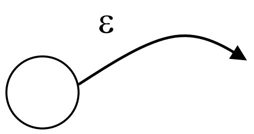
Finite Automata

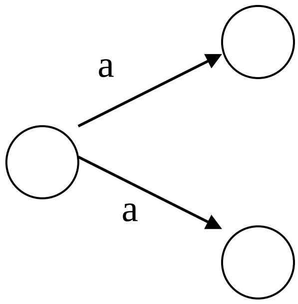
RES → NFA → DFA → Optimized DFA

Nondeterministic

1.



2.



Deterministic

1. no ε arc
2. unique labeling

   f : transition function

   f(s_i, a) s_i : current state, a: input

   is unique

NFA → DFA Conversion

(Start) ε-closure(S) where S is a set of state:

a set of state reachable from a state in S using only ε-arcs

(Method) S_0 : the start state of NFA

$S = \{S_0\} \cup$ ε-closure(S_0)

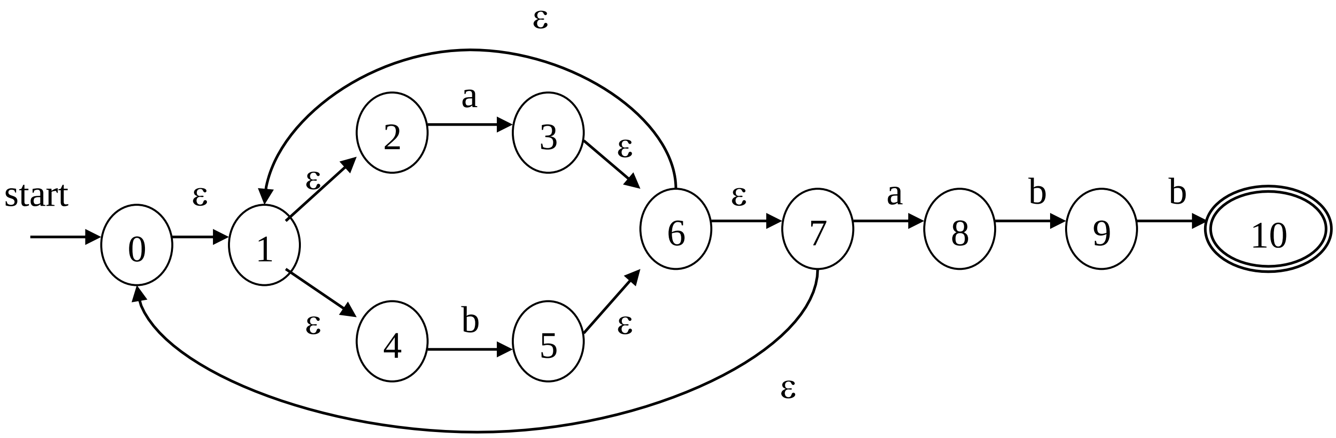
Repeat until no new set of states are generated for each input.

1. find all states reachable from the states in S using the input.
2. new $S = S' \cup$ ε-closure(S')

Finite Automata

RE : $(a \mid b)^*abb$

NFA



ε-closure(0) = {0, 1, 2, 4, 7} = A

	a	b
A = {0, 1, 2, 4, 7}	{1, 2, 3, 4, 6, 7, 8} = B	{1, 2, 4, 5, 6, 7} = C
B =	{1, 2, 3, 4, 6, 7, 8} = B	{1, 2, 4, 5, 6, 7, 9} = D
C	{1, 2, 3, 4, 6, 7, 8} = B	{1, 2, 4, 5, 6, 7} = C
D	{1, 2, 3, 4, 6, 7, 8} = B	{1, 2, 4, 5, 6, 7, 10} = E
E	{1, 2, 3, 4, 6, 7, 8} = B	{1, 2, 4, 5, 6, 7} = C

DFA

	a	b
A	B	C
B	B	D
C	B	C
D	B	E
E	B	C

Finite Automata

Minimum state partitioning method

non-final state $\leftrightarrow$ final state

$P_1 = \{A, B, C, D\}$

$P_2 = \{E\}$

	a	b
P_1	P_1	P_1
P_1	P_1	P_1
P_1	P_1	P_1
P_1	P_1	P_2
P_2	P_1	P_1

$P_{11} = \{A, B, C\}$

$P_{12} = \{D\}$

	a	b
P_{11}	P_{11}	P_{11}
P_{11}	P_{11}	P_{12}
P_{11}	P_{11}	P_{11}
P_{12}	P_{11}	P_2
P_2	P_{11}	P_{11}

Finite Automata

$P_{111} = \{A, C\}$

$P_{112} = \{B\}$

	a	b
P_{111}	P_{112}	P_{111}
P_{112}	P_{112}	P_{12}
P_{111}	P_{112}	P_{111}
P_{12}	P_{112}	P_2
P_2	P_{112}	P_{111}

they are the same(equivalent)

	a	b
A	B	A
B	B	D
D	B	E
E	B	A